FEBRUARY 11, 1952

Electrical World

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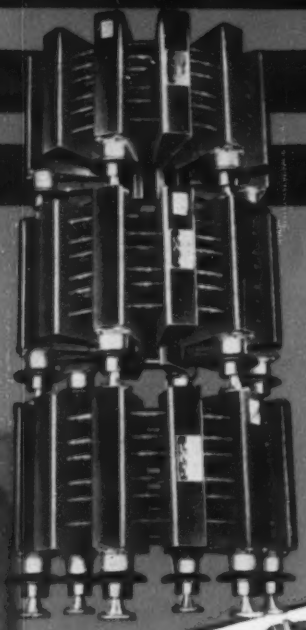
Dependable Circuit Protection

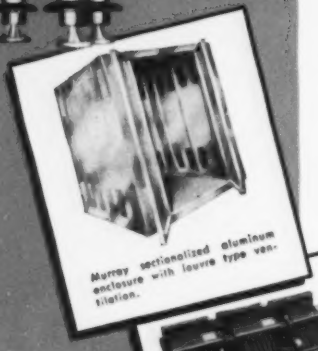
WITH

Murray

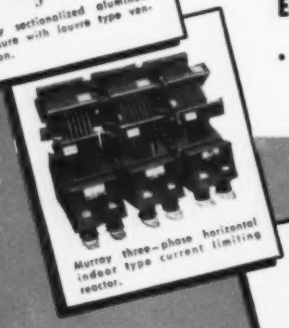
CAST-IN-CONCRETE
Current-Limiting Reactors



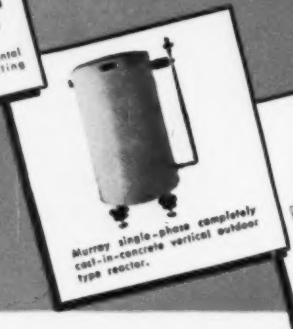
Typical Murray three-phase vertical outdoor type cast-in-concrete current limiting reactor.



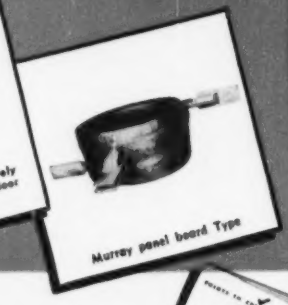
Murray sectionalized aluminum enclosure with louvre type ventilation.



Murray three-phase horizontal indoor type current limiting reactor.



Murray single-phase completely cast-in-concrete vertical outdoor type reactor.



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Engineered to your specifications...
...for indoor or outdoor service.

- Feeder
- Generator
- Motor Starting
- Neutral Grounding
- Transformer Equalizing
- Special Purpose
- Station Tie
- Bus Tie
- Shunt

} Reactors

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Murray

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50 Years of Service to the Electrical Industry

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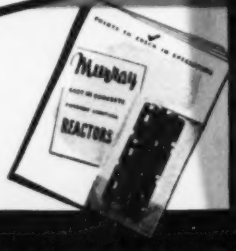
To help you give detailed information on reactors for your individual application, this comprehensive folder has been especially prepared. It provides a reliable guide to points to check in specifying all types of cast-in-concrete current limiting reactors. Write Murray for your copy today.



SERVICE ENTRANCE & METER EQUIPMENT • MAGNETIC CIRCUIT BREAKERS
SWITCHES • CURRENT LIMITING REACTORS • CROWS NEST AERIAL LADDERS

CAPACITORS IN PACKAGES

Almost everything these days comes neatly wrapped up in "packages," ready to use. And now the "package" concept has been extended to include switched capacitors. Units now come completely wired and in a skid-type crate. All the lineman has to do is knock the top and sides from the crate, skid the assembly over to the foot of the pole, and hoist it into place.

The idea had its beginnings with Commonwealth Edison, in Chicago, who asked three manufacturers to build the package assemblies in banks of 225 kva complete with switches. How they got the idea, and what they sought to achieve is told in the issue of Feb 25 by one of Edison's engineers.

AN OUNCE OF PREVENTION

Service has always been a watchword in the utility industry. But to the customers of Potomac Electric Power Company it has a very special meaning. For the Washington company is carrying the service concept a step further than most organizations and now extend a free monthly inspection service to commercial cooking establishments on their system. Today the company's appliance service department is visiting 71 governmental and 313 other installations of commercial cooking equipment every month.

Both the equipment manufacturers and the company find that the inspection service reduces maintenance because it finds trouble before it happens. Promptly taken care of, it prevents expensive shut-downs that lead customers to lose confidence in the dependability of electric cooking.

In the next issue the Washington company tells their experience with the program and how they run it.

MORE RANGE FOR RADIO

Utilities can easily increase the range of communications between their mobile radio units. Repeater—mobile relay—stations will do the trick. But first the Federal Communications Commission will have to be satisfied that they are needed. Two REA engineers have summarized six methods of using such facilities. The details will be told and the circuit arrangements diagramed and explained in the February 25 issue of Electrical World. If you are interested in extending the range of your radio equipment, don't miss this feature.

Electrical World

Published for 78 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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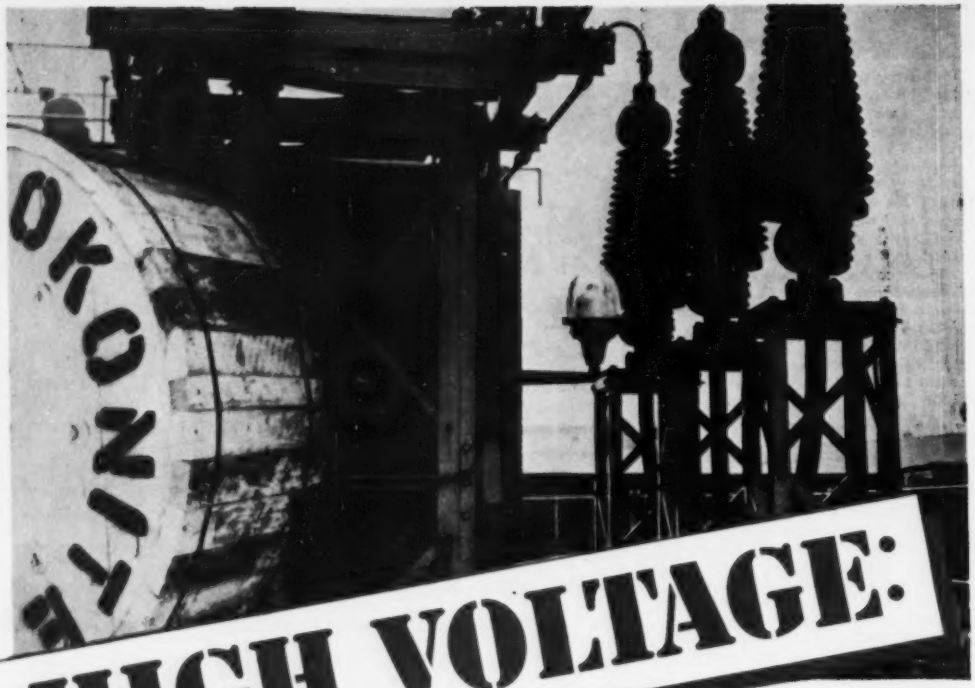

HIGH VOLTAGE:

HANDLE IT WITH OKONITE

For handling high voltage power, electrical engineers want equipment that has a high safety factor and an established record for reliability. These characteristics, long associated with Okonite products, are chief among the reasons why engineers continue to specify Okonite insulated cables for high voltage circuits and for other difficult and exacting jobs.

When engineers specify "Okonite" they know they are getting the benefits of over seventy years' experience in designing, making and installing cables. They also know that Okonite's three plants provide the most versatile facilities in the industry. For example:

When Okonite engineers are asked to recommend a cable design they are not confined by manufacturing limitations, since only Okonite is equipped to insulate cables by *all* the known methods, and uses all of them in regular production.

What about abnormal sizes or lengths? Okonite has made cables nearly six inches in diameter . . . only recently completed a single 7½ mile length of outsize cable that required 9 gondola cars for shipment.

Voltage limitations need be no concern. Okonite has always been a leader in the high voltage field, recently accepted the first order ever placed in America for 161,000 volt underground cable.

Okonite's versatility serves the buyer in other ways, too . . . in use of new and better materials, in advanced testing and research, in the kind of planning and thinking that results in greater value for your cable dollar. When you are adding new electrical circuits, it will pay you to specify "to be made by The Okonite Company, Passaic, New Jersey."

The best cable is your best policy

OKONITE OKONITE SINCE 1878 ***insulated wires and cables***

When emergencies cripple your system

— CALL ON GraybaR

Snow, sleet, wind, flood, fire — *each* is a potential crippler of service . . . a forerunner of possible full-scale emergency.

That's why — when elements strike — utilities call Graybar first. From experience, they've discovered Graybar's stand-out facilities for delivering emergency replacement items *fast* — wherever and whenever they're needed.

• A nation-wide network of Graybar offices and warehouses provides ready accessibility to stocks of essential pole-line supplies.

• Experienced, emergency-trained Graybar personnel have the know-how needed to initiate immediate action and efficient follow-through.

• Alert Graybar suppliers are always willing to co-operate in filling extraordinary needs . . . to add their weight to Graybar's own services.

The next time *you* need emergency help, make it a point to call your near-by Graybar office. You're sure to get efficient, helpful service — the kind of service that's invaluable in emergencies . . . a necessity in everyday operations.

216-92

Call Graybar first for...

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Executive Offices:
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IN OVER 100 PRINCIPAL CITIES

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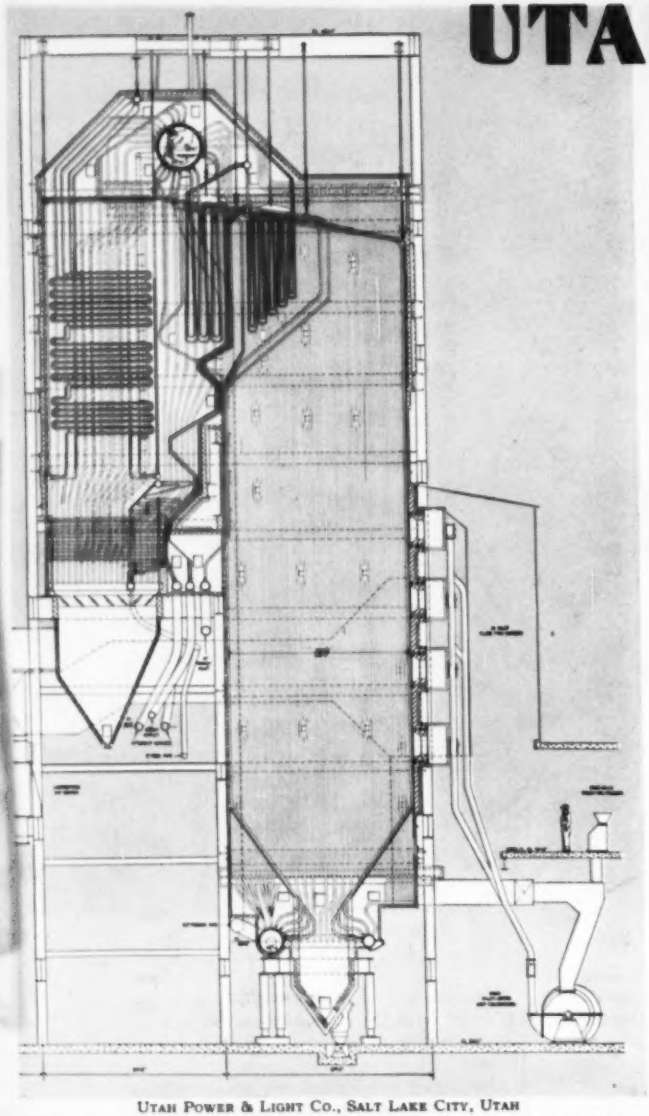

Utah Power & Light Co., Salt Lake City, Utah
575,000 lbs./hr. – 1700 psig, 1000°F. – 525,000 lbs./hr. reheat – 396 psig, 1000°F.
Bechtel Corp., Engineers.

Utah Power and Light Company is installing a 575,000 lbs. per hour 1700 psig 1000°F. Riley unit with 525,000 lbs. per hour reheat at 396 psig and 1000°F. at its Gadsby station at Salt Lake City as unit No. 2. Some of the outstanding features of this unit are mentioned on the following page. Unit No. 1 now in operation is a 620,000 lbs. per hour 1500 psig, 955°F. Riley unit. Unit No. 2 is to be fired with Riley "50" Pulverizers. Unit No. 1 is fired with petroleum pitch but designed for future pulverized coal firing.

At its Hale Station, Utah Power has installed a 450,000 lbs. per hour Riley pulverized coal fired unit and another Riley unit is installed at its subsidiary Western Colorado Power Co., Jim Bullock Plant at Montrose, Colorado.

Engineering Data

Capacity, 575,000 lbs./hr.
Design Pressure, 1,700 psig.
Steam Temperature, 1,000°F.
Reheat Temperature, 1,000°F.
Furnace Volume, 53,000 cu. ft.
Temp. Furnace Exit Gas, 1,900°F.
Furnace Width, 29'3"
Furnace Depth, 23'10⅞"
Efficiency, 87.8%
Fired by 4 Riley "50" Pulverizers and 12 Riley Flare Type Burners

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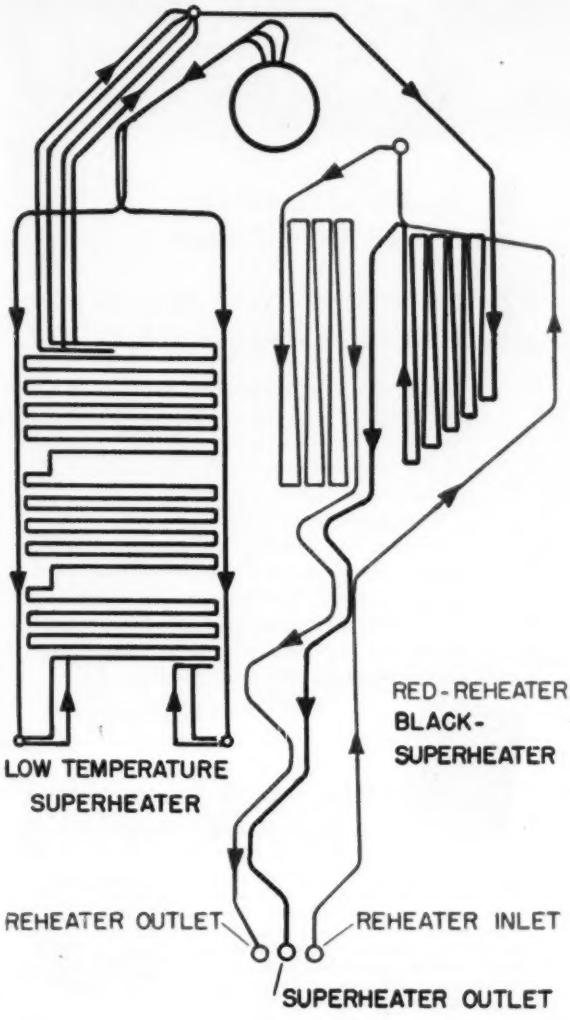
1700 psig 1000°F and 1000°F Reheat



Reheater Partially Radiant

Due to the large amounts of heat required to give 1000°F. steam temperatures for both superheater and reheater, design features must be incorporated which will give the desired steam temperatures and at the same time permit operation at sufficiently low furnace temperatures to prevent objectionable slagging of furnace and screen tubes.

Riley accomplishes this by making the first section of the reheater of radiant surface as illustrated in the accompanying diagram. With the relatively low reheater inlet temperature and high positive flow velocities the use of radiant surface is definitely warranted. By this design the desired steam temperatures are obtained with entering gas temperatures well below the danger point.

Uniform superheat temperatures over a wide load range are obtained by means of by-pass dampers beyond the economizer. A spray type temperature control is provided for the reheater. The use of four rows of burners also aids in controlling steam temperatures.

All tubes entering the upper and lower drums are welded to stub ends, shop welded into the drum shells. All superheater and economizer tubes are likewise welded to stubs ends welded to the headers. Such construction assures permanent tight connections.

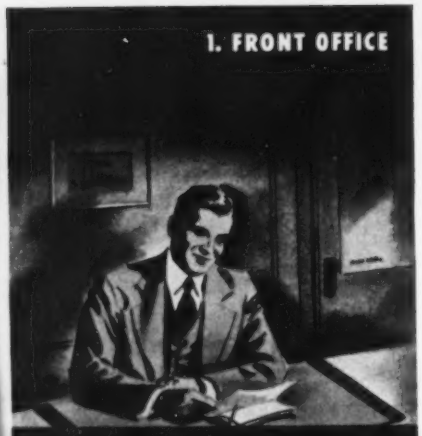
A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

TWO WAYS Reynolds ACSR SAVES You Money



1. COSTS LESS THAN OTHER TYPE CABLE

2. LIGHTER WEIGHT MEANS LOWER INSTALLATION COSTS

FRONT OFFICE can count their savings the moment they sign an order for Reynolds ACSR. Its first cost is considerably less than other types of cable . . . and aluminum's light weight adds further savings through lower transportation costs.

When Reynolds ACSR hits the field there's *more* good news. Aluminum's light weight makes for easier, faster stringing. Higher strength of ACSR permits a longer distance between poles—eliminating up to 4 poles per mile. Or, because the sag of ACSR is less than that for other types of cable, shorter poles or supporting towers can be used.

FREE . . . ACSR MANUAL FOR ENGINEERS CONTAINS COMPLETE INFORMATION CHARTS AND TABLES. Please request on your business letterhead.

NOW . . . 4 Reynolds Master Reels do the work of 100 wooden reels! Handle ACSR quicker and more economically. Eliminate reel inventory and exchange. Cut down on handling, storing, record-keeping as well as reducing damage cost to a minimum. Reynolds Master Reels and Coils are easily assembled by linemen right on the job . . . are sturdier than wooden reels.

For complete information

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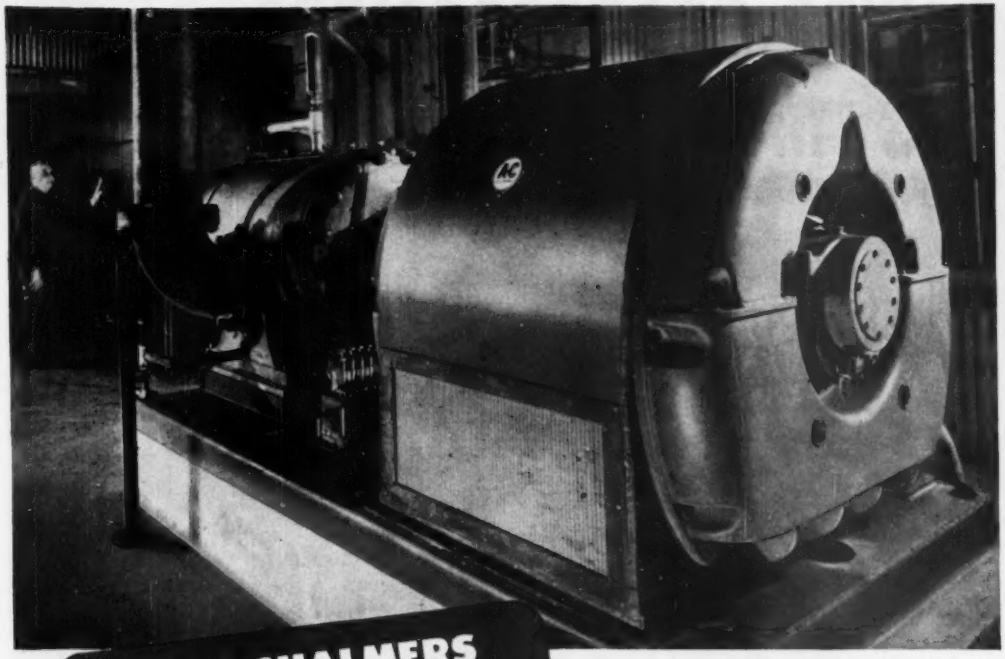
REYNOLDS ALUMINUM



All Allis-Chalmers installation: 250-hp, 495-rpm, drip-proof cage motor; single-stage rotary compressor; controller.

ALLIS-CHALMERS Large Motors ... Provide Low-Maintenance Reliability

START with construction features that have already earned a reputation for ruggedness and reliability. Add all-around drip-proof and mechanical protection. And do this without sacrificing accessibility for routine maintenance.

That's how Allis-Chalmers large cage motors were redesigned. That's why you'll want these advantages in your new motors:

IMPORTANT FEATURES

● Rigid cast-iron end shields assure you of correct bearing alignment and corrosion resistance as well as drip-proof protection.

● Capsule-type bearing housings enable you to leave the bearings and oil supply sealed against abrasive dirt when you remove the top halves of the end shields to clean the windings.

● Large air discharge openings in the yoke invite you to keep the ample passages back of the stator core clean and unobstructed. They also make installation easier.

● Louvers on air discharges and design of intakes keep foreign objects out of the motor.

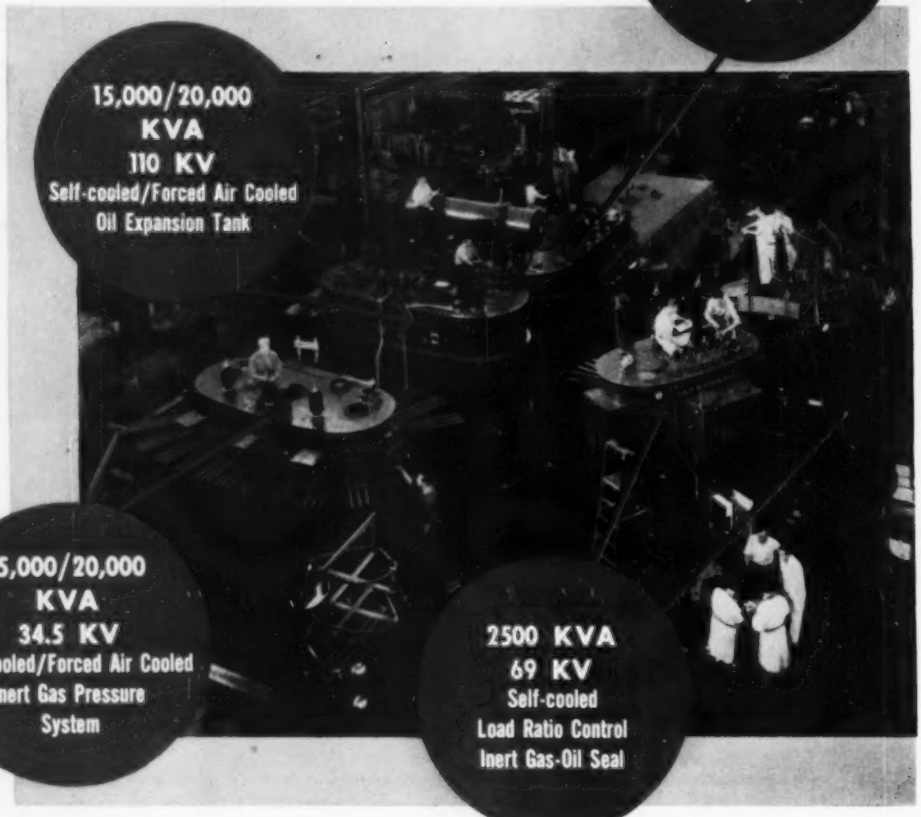
A-3561

NEW BULLETIN

Built in ratings from 60 hp at 300 rpm to 1750 hp at 1800 rpm, these cage motors are described in detail in bulletin 05B7542A. Ask your nearby Allis-Chalmers representative for a copy, and see for yourself why these redesigned motors provide a new low in maintenance and a new high in reliability. Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

POWER TRANSFORMERS assembled HERE..



This section of the Pennsylvania plant is known as the Finishing Department. All Power transformers stop here for final assembly and finishing before going to the Test Department.

The group of transformers pictured is representative of the types of Power transformers designed and manufactured by Pennsylvania.

Transformers in this group range from 2500 Kva to 30,000 Kva. Some are equipped with no load tap changers; others with underload tap changers.

Many types of cooling methods are represented — self-cooling, forced air cooling, and forced oil cooling.

Methods of oil preservation include Inert Gas-Oil Seal, Oil Expansion Tank, and Inert Gas Pressure Systems.

Other Power transformers regularly built by Pennsylvania have ratings up to 100,000 Kva and voltages up to and including 230 Kv.

Pennsylvania TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

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These great condenser tubes have enough antimony to resist dezincification. And, in addition, antimony is one inhibitor that will not weaken the tube. The metal starts with the right grain structure and retains it . . . it stays tough and withstands the stresses of heavy duty assignments.

You'll do better with Chase Antimonial Admiralty Condenser Tubes! Send coupon for FREE book on Condenser and Heat Exchanger Tubes.

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Pacific Gas and Electric Company's newest generating station uses Ingersoll-Rand's new Class HMTA boiler feed pumps

Ingersoll-Rand boiler feed pumps at Contra Costa with HMTA primary pumps at right and CHTA secondary pumps at left of motor driver.

The Pacific Gas and Electric Company's new and ultra-modern steam plant at Antioch, California will make available 300,000 kw to help meet the high system load of the productive Contra Costa county area. This modern boiler feed pump installation – incorporating both the new HMTA and the popular CHTA pumps – is designed to establish new standards of high pressure pumping economy.

The Contra Costa Station uses the two-pump feedwater system – each pump set carrying half the load of a 100,000 kw generating unit. The six-inch, 3-stage HMTA primary pumps, which handle 228° water at 24 psi, discharge to the low pressure heaters at 574 psi. The five-inch, 8-stage CHTA "double case" secondary pumps take 430° water at 520 psi and deliver 1310 gpm at 1990 psi. Tandem mounting permits centralized lubrication and low temperature injection from primary pump to stuffing boxes of secondary unit, which means longer packing life.

Ingersoll-Rand Class HMTA multi-stage centrifugal pumps, with advanced design and a Unit-Type rotor assembly, are available in capacities to 1600 gpm and pressures to 1200 psi. Your nearest I-R representative will be glad to give you complete information.

CONDENSERS AND AUXILIARIES ARE I-R TOO

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Will Do the Job Better... Faster... and More Safely

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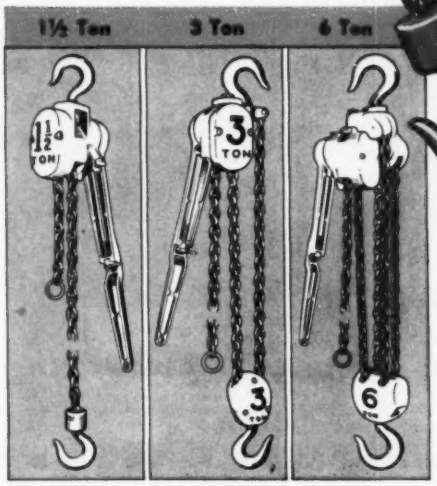
from ¾ to 6 tons



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Built of high grade aluminum alloy — with HERC-ALLOY flexible, welded chain as standard equipment — the Kearney Line Pull-R is one of those all-purpose tools your workman can immediately put to good use.

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By eliminating dangerous, slow, makeshift methods . . . the Kearney Line Pull-R soon pays for itself. It materially increases the safety factor on any job you do.

It all adds up to a profitable addition . . . when you place a Kearney Line Pull-R in your workman's tool kit.

4 capacities — from ¾ to 6 tons.

For complete information including weights, sizes and prices, write for Bulletin No. 18-45.

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*From the remarks made by a spokesman of Defense Electric Power Administration before the Transmission and Distribution Committee of Edison Electric Institute at a recent meeting.

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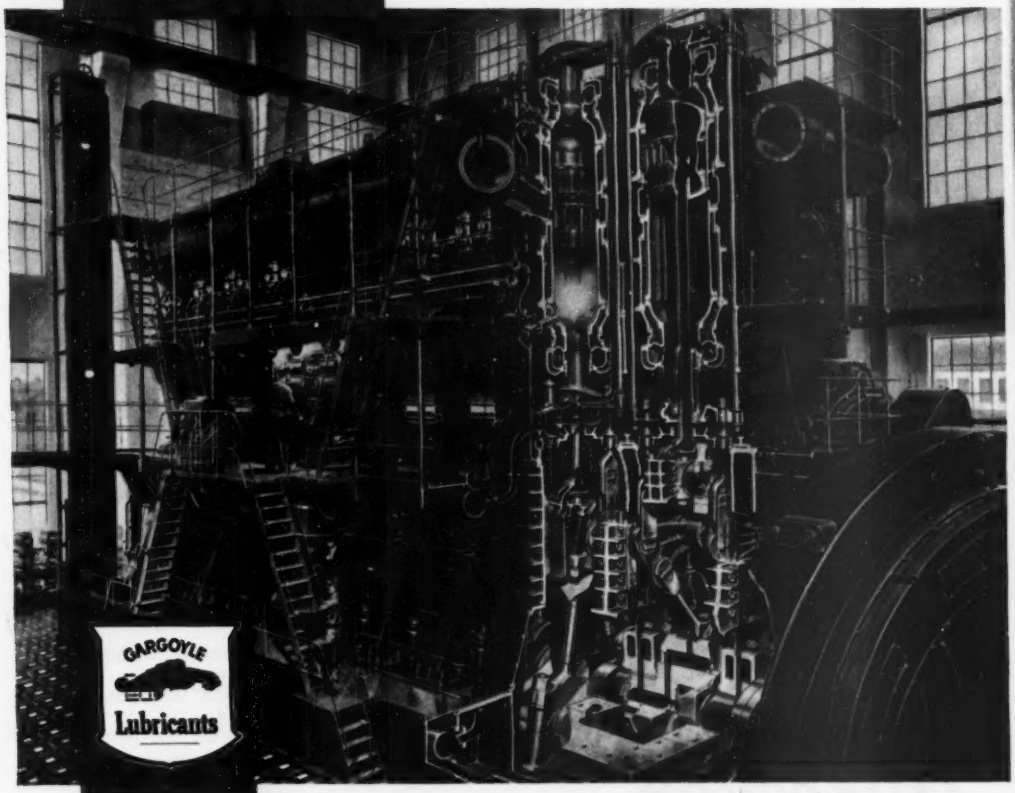
To protect those mammoth cylinders and pistons, the operator chose a famous Gargoyle Diesel lubricating oil. This same kind of Correct Lubrication is available for your power, production, and other plant machinery... to assure maximum output, lowest possible upkeep costs. Just call your Socony-Vacuum Representative.

gets the World's Greatest Lubrication Knowledge and Engineering Service

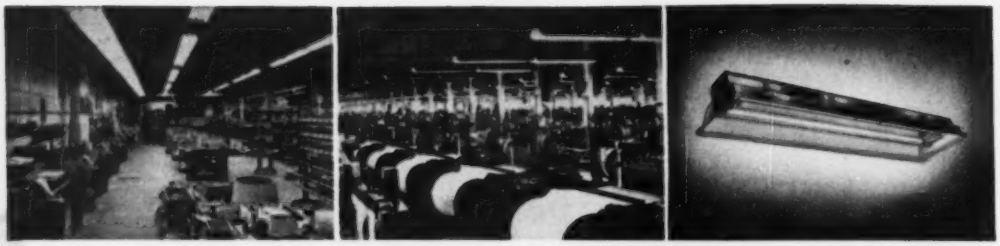


SOCONY-VACUUM

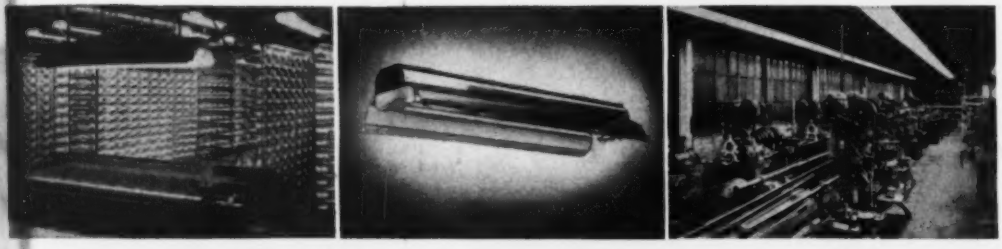
Correct Lubrication

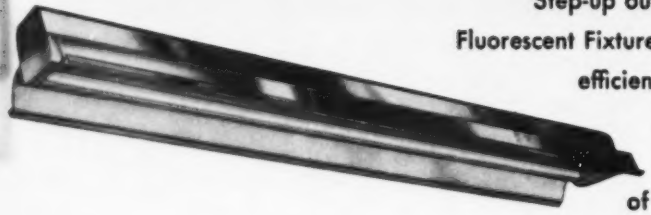
SOCONY-VACUUM OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

Wheeler lights the way



...*to* INCREASED DEFENSE PRODUCTION!





Step-up output with *specialized* Wheeler Fluorescent Fixtures! Their greater lighting efficiency pays off in higher quality . . . *increased production* — on every job, in every type of plant condition. And Wheeler engineering means ease of installation and proven maintenance savings. Write Wheeler Reflector Co., 275 Congress St., Boston 10, Mass.

Wheeler REFLECTORS — Distributed Exclusively Through Electrical Wholesalers

MADE BY SPECIALISTS IN "SKILLED LIGHTING" EQUIPMENT SINCE 1881

Approved by UNDERWRITERS LABORATORIES

Here's the MOST PRACTICAL design

LARGER SURFACES

to grip with wrenches from ANY ANGLE—using either a socket or open-end wrench.

MORE STRENGTH. In competitive torque tests, Penn-Union Split-Bolt Connector withstands 15% to 55% higher clamping pressures.

MAXIMUM CONTACT provided by V-groove; conductors protected by beveled slot.

PRECISION MADE, with rigid inspection. Smooth accurate threads assure maximum pressure—permanently maintained.

Far More in use than any other

For taps, dead-ends, parallel connections, etc., in any location. Can be furnished in bronze or alumium. Re-usable over and over.

With or without retainer

PENN-UNION ELECTRIC CORPORATION, Erie, Pa.

Canada: Dominion Cutout Company, Ltd., 250 Richmond St. West, Toronto

The COMPLETE Line of Conductor Fittings

PENN-UNION

You can do a lot

with a little

GOLD SEAL TAPE

Come what may, veteran linemen and electricians know they can depend on Gold Seal. It tapes up tight and makes a longer *lasting* bond. Reason? Production is laboratory-controlled by Jenkins Bros.

That's why the fresh, tacky feel of Gold Seal will not dry out. Why roll after roll tears evenly, quickly, without raveling at the edges. Why, in short, Gold Seal *goes further* — there's less waste.

Ask your supplier, next time, for Gold Seal Tape. Try it on your toughest jobs. See if it doesn't help you produce better-taped joints, and more joints per roll. See if you don't agree that Gold Seal is tops in tape!

In single rolls and handy 10-roll containers. Each roll cellophane-wrapped to keep it *factory-fresh*. Jenkins Bros. (Rubber Division), 100 Park Ave., New York 17, N. Y.

Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet both ASTM and Federal Specifications.

JENKINS *Gold Seal Tape*

FRICTION and RUBBER TAPES

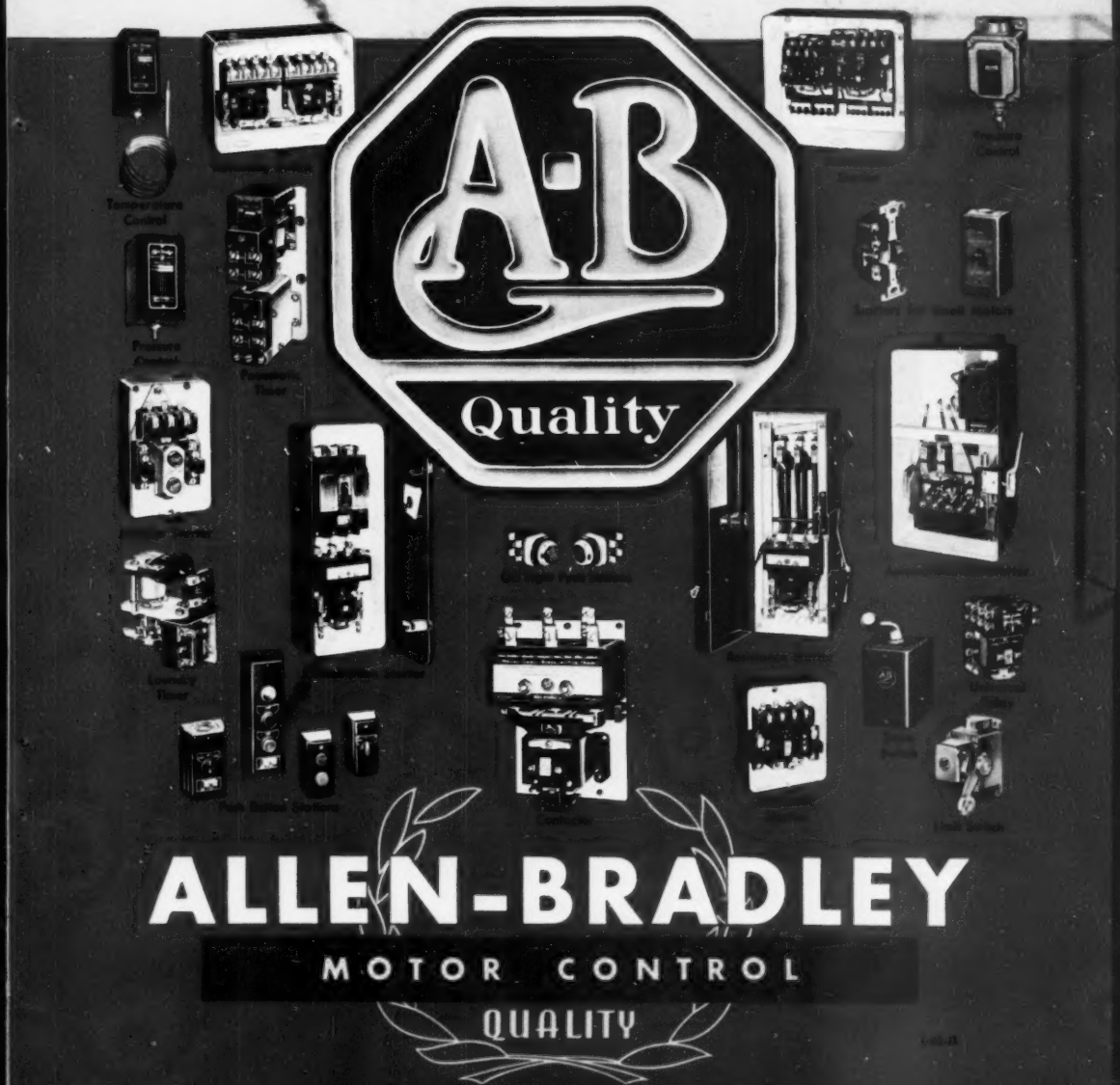
YOU STANDARDIZE on

THIS QUALITY LINE OF MOTOR CONTROLS

This complete line of trouble free motor controls . . . with manual and automatic starters and accessories in a wide range of enclosures . . . is popular with plant engineers, maintenance men, and electrical contractors.

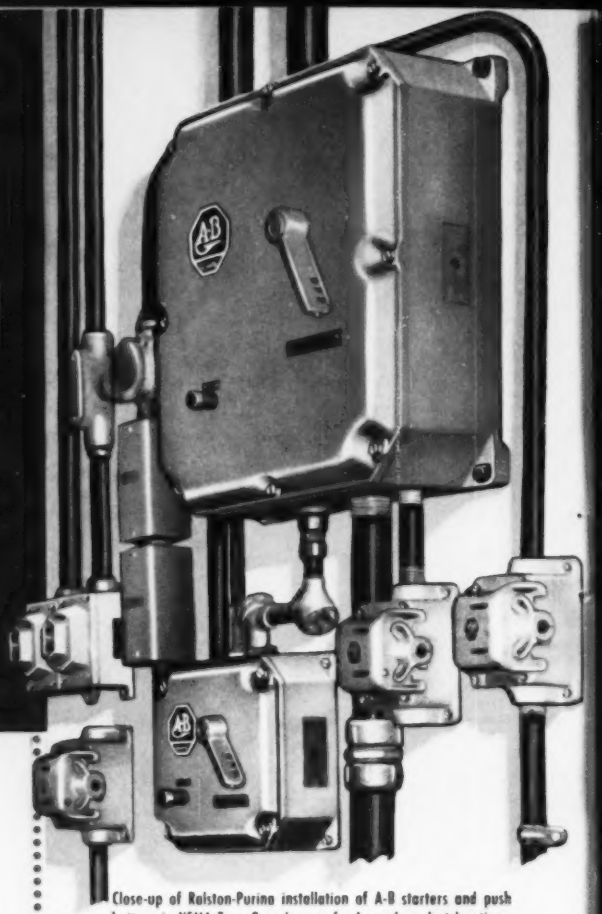
You can find in the new 92-page A-B Handy Catalog the right combination of control units to satisfy any operating requirement. This illustrated reference on manual and automatic solenoid motor controls is yours for the asking.

Allen-Bradley Co. • 1316 S. Second St., Milwaukee 4, Wis.



ENCLOSURES are IMPORTANT

Avoid COSTLY maintenance by using the right enclosure for every job



Close-up of Ralston-Purina installation of A-B starters and push buttons in NEMA Type 9 enclosures for hazardous dust locations.

It pays out . . . in lower maintenance, fewer shutdowns, and greater production . . . to use the correct enclosure for each motor starter.

Some installations need waterproof or weatherproof enclosures. Others require cast iron cabinets to prevent explosions in dusty atmospheres. For bad corrosive conditions, oil immersed starters may be essential. Of course, for normal applications, the general purpose pressed steel enclosure with bonderized and black enameled finish is popular.

You can always find the right enclosure in the Allen-Bradley line to protect your plant, personnel, and production schedules.

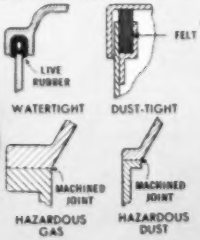
Allen-Bradley Co. 1316 S. Second St., Milwaukee 4, Wis.

1-52-MR

THERE IS A STANDARD ENCLOSURE FOR EVERY TYPE OF INDUSTRIAL SERVICE

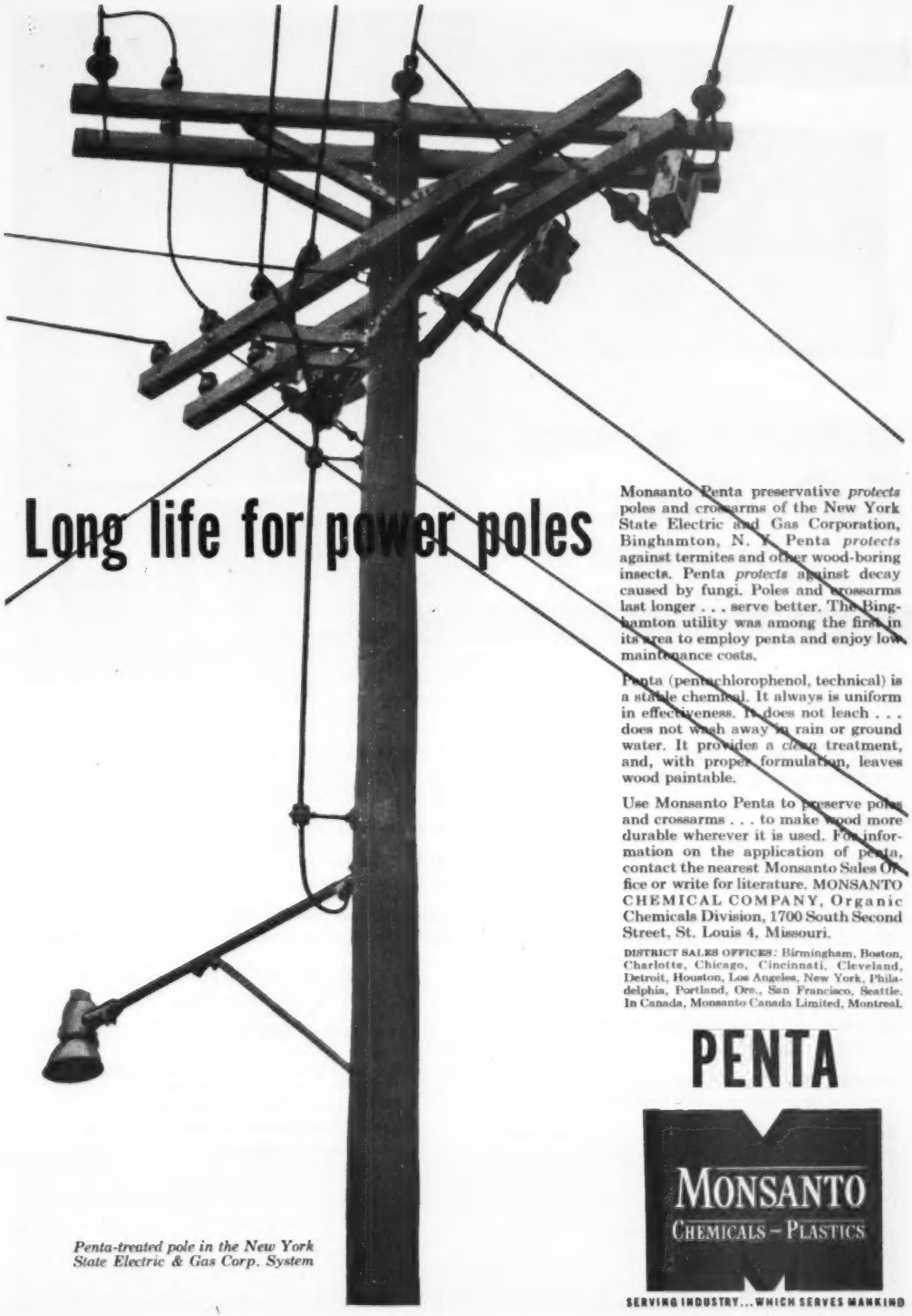
TYPICAL CONSTRUCTIONS

Sectional Views of Cover Seals



ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS



Long life for power poles

Monsanto Penta preservative *protects* poles and crossarms of the New York State Electric and Gas Corporation, Binghamton, N. Y. Penta *protects* against termites and other wood-boring insects. Penta *protects* against decay caused by fungi. Poles and crossarms last longer . . . serve better. The Binghamton utility was among the first in its area to employ penta and enjoy low maintenance costs.

Penta (pentachlorophenol, technical) is a stable chemical. It always is uniform in effectiveness. It does not leach . . . does not wash away in rain or ground water. It provides a *clean* treatment, and, with proper formulation, leaves wood paintable.

Use Monsanto Penta to preserve poles and crossarms . . . to make wood more durable wherever it is used. For information on the application of penta, contact the nearest Monsanto Sales Office or write for literature. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto Canada Limited, Montreal.

PENTA

MONSANTO
CHEMICALS – PLASTICS

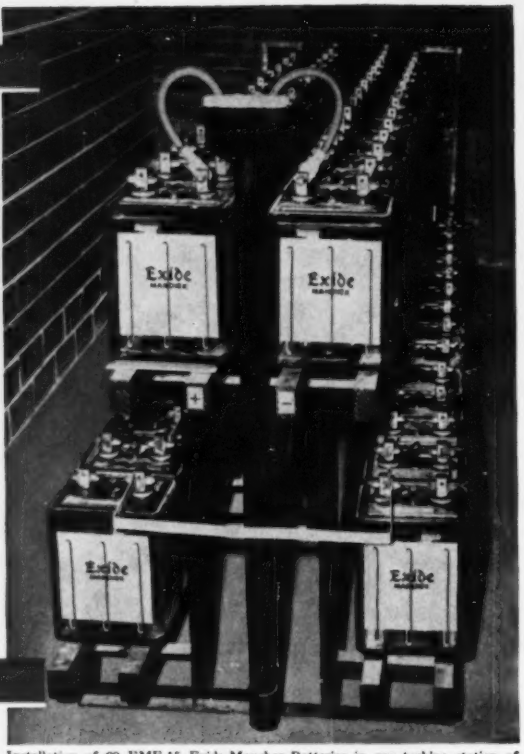
SERVING INDUSTRY... WHICH SERVES MANKIND

Penta-treated pole in the New York State Electric & Gas Corp. System

Edward M. Graham station of Bangor Hydro Electric Company, Bangor, Me.

In the Valley of the Penobscot

Exide-Manchex BATTERIES



Installation of 60 EME-15 Exide-Manchex Batteries in gas turbine station of Bangor Hydro Electric Company.

Here in the heart of Down-East Maine is one of America's most modern electric utilities—the Bangor Hydro Electric Company. It was the first to use a regenerative type gas turbine, the installation of which aroused widespread interest in the industry. Other items of equipment are equally modern. Among them are Exide-Manchex Batteries.

The Exide-Manchex Batteries in the Edward M. Graham station provide power for switchgear operation. They furnish adequate emergency lighting, operate 60 indicating lamps, and run two 2-hp. lubricating pump motors. Exide-Manchex Batteries are preferred by many outstanding utility companies because they assure:

POSITIVE OPERATION: Dependable performance at ample voltage with no switching failures.

INSTANTANEOUS POWER: High rates for switchgear operation with adequate reserve power for dependable performance of all other control circuits and for emergency lighting.

LOW OPERATING COST: Extremely low internal resistance.

LOW MAINTENANCE COSTS: Water required about twice a year. No change of chemical solution needed during life of battery.

LOW DEPRECIATION: Sturdy, long-life construction.

GREATER CAPACITY in a given amount of space avoids overcrowding of equipment.

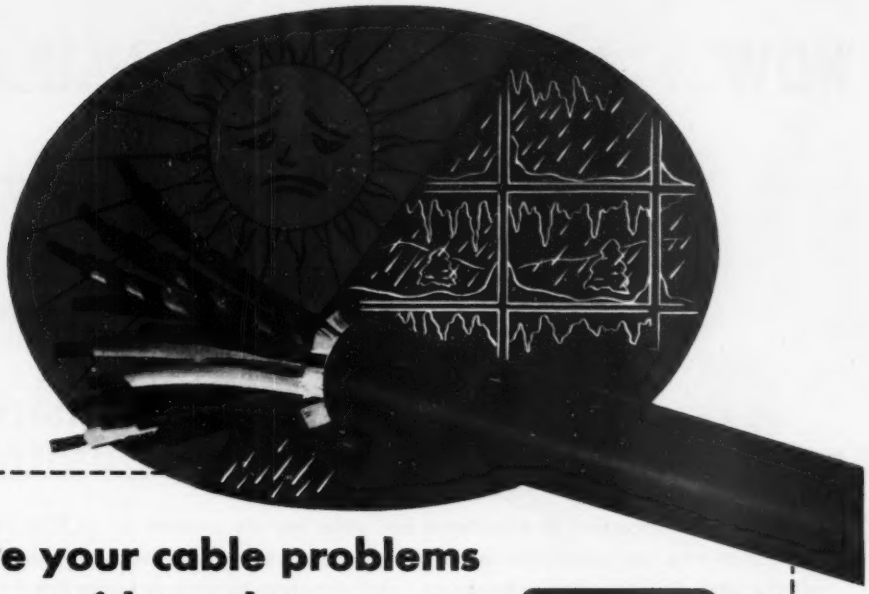
These features combine to make Exide-Manchex *your best battery buy* for all control and substation services.

You get all these features in the Exide-Manchex

- The *exclusive*, long-life manchester positive plate.
- Slotted plastic separators, impervious to chemical and electrical reaction.
- Plastic spacers for plate alignment.
- Latest development in molded glass jars.
- Heavy terminal posts with copper inserts for extra conductivity.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2
Exide Batteries of Canada, Limited, Toronto
"Exide" and "Manchex" *Reg. Trade-marks U.S. Pat. Off.*

1888...DEPENDABLE BATTERIES FOR 64 YEARS...1952



solve your cable problems with modern, all-plastic, all-weather Ankoseal®

Supervisory Control Cable
Pilot Cable • Relay Cable
Station Control Cable
Meter Cable
for Overhead or Direct Burial Use

Ansonia Ankoseal, a remarkable, thermoplastically insulated and jacketed cable, is outstanding for dielectric strength, flexibility and other important factors. It possesses notable flame and oil resisting qualities and is highly resistant to acids, alkalies, sunlight, moisture and most solvents. Because of its low dielectric loss in high-frequency transmission, Ansonia Ankoseal is well adapted to both radio and audio fields.

Increasing numbers of alert utility engineers are using Ankoseal for Supervisory Control Cable, Pilot and Relay Cable, Station Control Cable and Meter Cable. They consider better service records, low cost of installation and maintenance, and lesser replacement frequency of utmost importance.

Write us today about your cable needs.

THE ANSONIA ELECTRICAL COMPANY
SUBSIDIARY OF NOMA ELECTRIC CORPORATION
ANSONIA, CONNECTICUT

NOW . . . ANOTHER GREAT INSULATOR

PURIFIED

GREATER TOUGHNESS — GREATER DENSITY
GREATER MECHANICAL and ELECTRICAL UNIFORMITY

More than half a century of experience has gone into the creation of VICTOR PURIFIED PORCELAIN—the wet process porcelain of highest insulation values, unequalled density and rock-like strength and resistance to impact. Laboratory tests prove it to be the finest insulator porcelain ever made!

VICTOR PORCELAIN Is Truly PURIFIED

1. Only premium grades of flint, feldspar and clay are used.
2. Every shipment is stored in separate bins and tested for purity and uniformity before using.
3. All clay is de-aired to achieve porcelain of maximum density.

AND NOW! . . **all water used in processing is de-mineralized to remove the mineral salts which fuse during firing into microscopic, glass-like impurities!**

RESULTS: **Increased Impact Resistance . . . Greater Density . . . Greater Manufacturing Control . . . Greater Product Uniformity!**

DON'T SETTLE FOR ANYTHING LESS THAN VICTOR PURIFIED PORCELAIN

Get All the Facts from Your VICTOR Representative

V

J. A. Perkins Co.
Boston (Westwood), Mass.

T. B. Daily
New York, N. Y., Jersey City, N. J.

John J. Herrity
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L. Morris Landers Co.
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Continental Sales & Engineering Co.
Pittsburgh, Pa.

Public Service Supply Co., Inc.
Cleveland, Ohio

H. J. Schwarberg
Cincinnati, Ohio

L. M. Rudbeck
Indianapolis, Ind.

David D. Schneider
Louisville, Ky.

Southland Sales Agents
Memphis, Tenn.

Brainard & Bair
Detroit, Mich.

Goide & Dunlap
Chicago, Ill.

Alton M. Johnson Co.
Minneapolis, Minn.

H. R. Koch Co.
St. Louis, Mo.

F. R. Hearn Co.
St. Louis, Mo.

The Chas. L. Ward Co.
Kansas City, Mo., Des Moines, Iowa
Oklahoma City, Okla.

Southwest Sales & Service Co.
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Geo. E. Tarbox Co.
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Boise, Idaho

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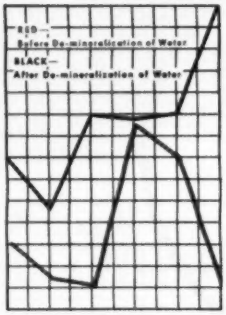
Phoenix, Ariz., San Francisco, Cal.
Los Angeles, Cal., Portland, Ore.
Spokane, Wash., Seattle, Wash.

ADVANCE FROM VICTOR — PORCELAIN!

VICTOR PURIFIED PORCELAIN

Finest Insulator Porcelain Ever Made!

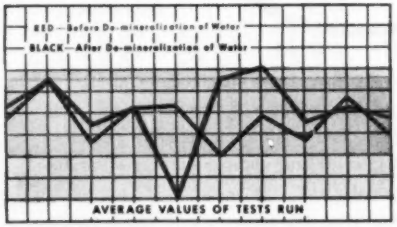
LABORATORY TESTS PROVE IT!



Results of Mechanical Impact Tests

MECHANICAL IMPACT TESTS*

Removal of mineral salts from the water used in processing VICTOR PURIFIED PORCELAIN results in an average of 18% higher mechanical impact values. The graph at the left shows actual values obtained from tests preceding and following installation of water de-mineralizing equipment.



Results of M & E Strength Tests Showing Range of Variation

M&E STRENGTH TESTS*

Installation of water de-mineralizing equipment shows an improvement of 24% in the range of variation of M & E strength values over the range obtained before installation of this equipment. The graph above indicates the remarkable increase in uniformity of product.

*Tests made on VICTOR 10", 15,000 lb. suspension insulator.

VICTOR INSULATORS

VICTOR INSULATORS, INC. • VICTOR, NEW YORK

Testing and servicing are made easy by control cabinet with door hinged at bottom to form a "workbench"—and by easily removable flexitest drawout-type relay chassis.

New dollar-saving advantages have been added to the URL-8 Feeder Voltage Regulator. *Testing and servicing are now made easier, faster.*

A new package control permits removal of the entire assembly as a unit—in the field—for testing or repair. Or a stand-by unit can be inserted in a matter of seconds. Mounted in a drawout-type flexitest case, it facilitates quick testing, repair or replacement. Also, the door of the control cabinet is hinged at the bottom, to form a "workbench" during inspection and servicing.

Single-pole mounting, made possible by lightweight construction, results in lower installation costs. Simple, direct drive tap changer cuts maintenance. The characteristics of the voltage-regulating relay assure close regulation. Separate resistance and reactance line drop compensation is adjustable by individual dials.

Get complete information from your nearby Westinghouse representative, or write for Catalog 47-430. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70586

YOU CAN BE SURE... IF IT'S Westinghouse

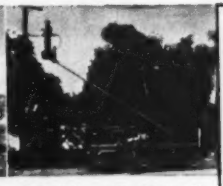
VOLTAGE REGULATORS

Now you have an FWD for small crew units, too!

This model LD answers demand for a true 4x4 in the light-duty class. And you get it with standardized bodies that fit your work.

An FWD earth boring rig with full-torque power take-off mounted on the new LD chassis.

The LD is a natural choice for materials transport. 14,500 lbs. gross vehicle weight.



This LD is a mobile "platform" for low cost, efficient tree trimming.

Look into the dollar savings and performance you can get with the new LD! This *light-duty* model has brought acknowledged FWD advantages to an entirely new FWD work range. AND — you can get the LD complete with the exact type of body and equipment you need! FWD is the *central source* for complete mobile workshops (78 combinations) . . . including cabs, winches, derricks, boring machines, platform and line bodies. Get full facts from FWD or a nearby FWD distributor. The Four Wheel Drive Auto Co., Clintonville, Wisconsin, and Kitchener, Ontario.

Built by the makers of America's Foremost Heavy-Duty Trucks

You buy more than a truck when you buy an FWD

Extra traction and proper distribution of weight and power give you all this:

- Ability to follow the job safely, on or off the highway.
- Ability to restore service faster — meet construction schedules — regardless of weather.
- Lower maintenance cost (up to twice the tire life).
- Up to twice the truck life.

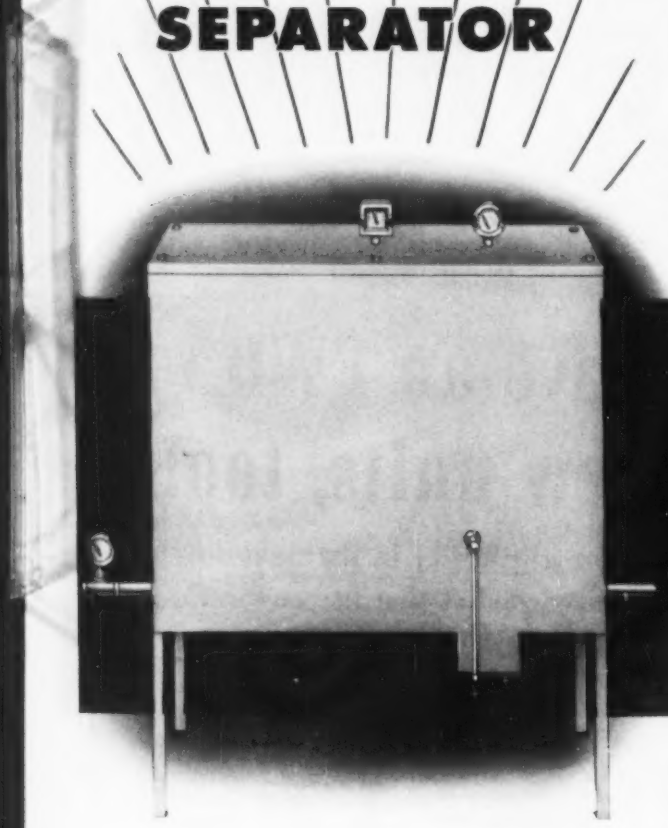
World-Wide Sales and Service

NEW HOUDAILLE Water-Oil SEPARATOR

NEW DESIGN . . . New Principle of Operation! Honan-Crane's amazingly simple, practical, new—Houdaille Water-Oil Separator, *for all types of turbines,* reduces water content of oil to an insignificant trace—keeps oil clean and safe to use indefinitely!

Separator eliminates the necessity for discarding oil regardless of the type of contamination encountered. This is possible because it *performs a complete filtering service*—removing solid contamination, acids and other sludge-forming products of oxidation *—as it separates the water.*

Separator replaces tedious, inefficient, dehydration methods; eliminates faulty lubrication and equipment damage. Pays for itself quickly in oil savings alone.



EASY TO INSTALL
SIMPLE TO OPERATE

REMOVES WATER
FROM TURBINE OILS
PROLONGS
SAFE-USE LIFE
INDEFINITELY

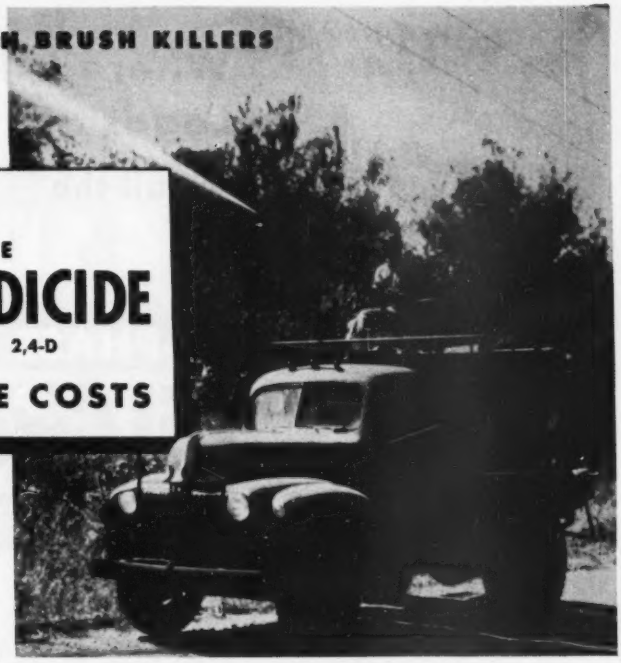
Get full information today. Equipment bulletin with complete details available on request. Write direct to:

WORLD LEADING OIL FILTER MANUFACTURER

Honan-Crane Corp. 819 Wabash Avenue, Lebanon, Indiana
a subsidiary of **Houdaille-Hershey Corp.**

Thompson Chemicals

FIRST NAME IN BRUSH KILLERS



New....Superior

LOW VOLATILE

BRAMBLE-WEEDICIDE

2,4,5-T **2,4-D**

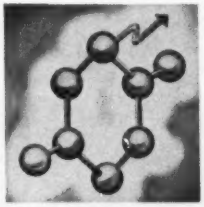
CUTS CLEARANCE COSTS

- **PENTYL ESTERS FOR LOW VOLATILITY**
- **EXTRA HIGH SURFACE CREEP FOR EXTRA KILL**
- **ABSORPTION RATED FOR EFFICIENT WOODY GROWTH CONTROL**

Delivers More Killing Units Per Dollar

Bramble-Weedicide, the new, improved Thompson brush killer specially recommended for clearing rights of way, is 70% more economical than mechanical or hand clearing methods. Up to 25% more effective and economical than older chemical controls.

Whether you spray foliage by air, truck or tractor or from knapsack, or employ basal bark treatment, you get positive kills of even hardiest species at lowest cost per mile with Thompson's superior Bramble-Weedicide.



Special low volatile tailor-made pentyl esters, absorption rated for quicker translocation, more effective results. An exclusive creeping agent adds increased surface contact on leaf or stem for extra action.

Write, describing nature of growth and type of job for helpful information on what to apply, how to mix and when to spray for maximum economy and effectiveness. Thompson manufactures many kinds of brush and weed killers. Caution: Order NOW to be assured of ample supply.

Thompson Chemicals

other superior

WEED & BRUSH KILLERS

- **WEEDICIDES:** 2,4-D Esters and Amines
- **BRAMBLCIDE** 2,4,5-T Low Volatile Ester
- **PHYTOCIDE** } General Weed Killers
- **PENTA-WEEDICIDE** }

DISTRIBUTORS: SOME TERRITORIES STILL OPEN

Thompson **CHEMICALS CORP.**

St. Louis 3, Missouri
Los Angeles 27, California

Where 3-Phase Loads are a Factor

Big

install the

KEARNEY

3-PHASE

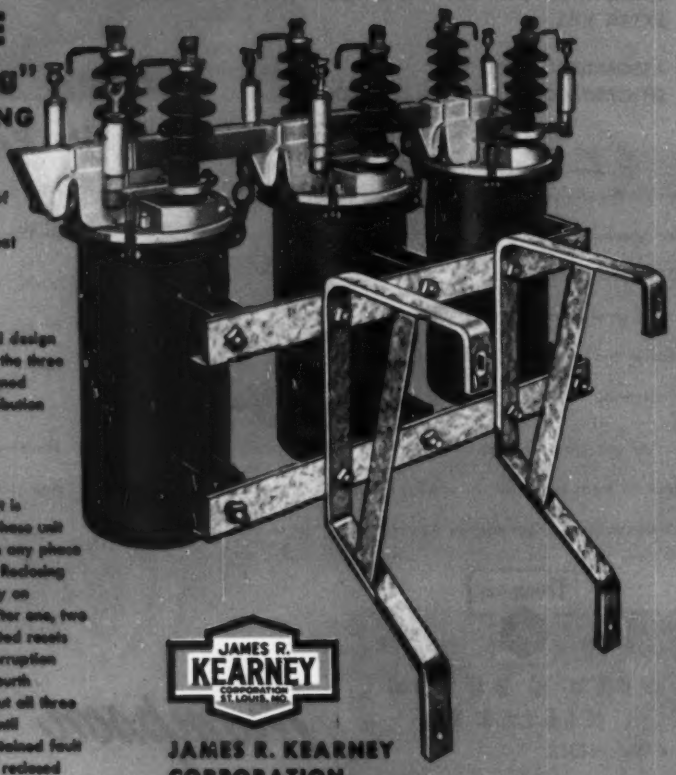
Oil Circuit Recloser

ELIMINATE "Single Phasing"

PREVENT DAMAGING 3-PHASE MOTORS

This sturdy, compact unit consists of three single phase reclosers mechanically linked together so that a sustained fault on any phase automatically causes all three to lock out on the fourth operation.

Incorporating all of the advanced design features of the single phase unit, the three phase recloser is especially designed for use on rural three phase distribution lines or in outlying substations.



HOW IT WORKS

Operation of the three phase unit is identical with that of the single phase unit except that a permanent fault on any phase causes the other two to lock out. Reclosing and resetting occur independently on each phase. If the fault clears after one, two or three reclosures, the unit affected resets for normal operation with no interruption of three phase service. On the fourth operation, the mechanism locks out all three phases and remains locked out until manually reclosed. When the sustained fault is cleared all three reclosers are reclosed manually by the simple operation of pushing one pull ring up into the protective hood.

Write for complete information.

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Ave., St. Louis 10, Missouri

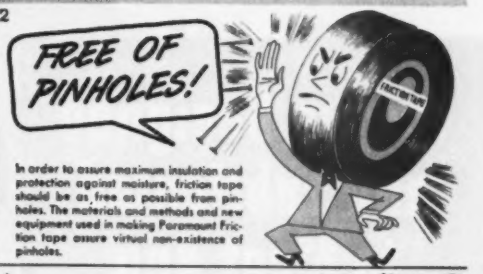
Canadian Plant: Guelph, Ontario

PARAMOUNT FRICTION TAPE by Haartz-Mason

1

Made under the most exacting requirements in the industry, Paramount Friction tape can be tightly wrapped — yet can be torn readily as required. A margin of safety in this respect is added to every roll of Paramount Friction tape.

2



In order to assure maximum insulation and protection against moisture, friction tape should be as free as possible from pinholes. The materials and methods and new equipment used in making Paramount Friction tape assure virtual non-existence of pinholes.

3

Automatically cut with smooth, neat edges on Cameron cutting machines. These machines wind it on the cores under tension. This is your insurance against raveling.

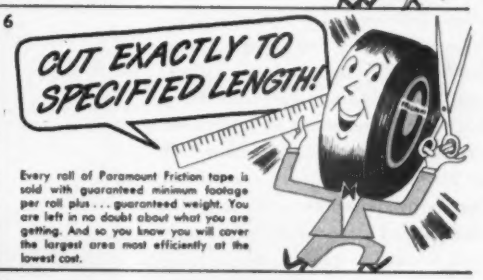
4

Under controlled temperature and humidity, Paramount Friction tape is strictly tested for permanence of adhesion.

5

Taken from stock at regular intervals, sample rolls of Paramount Friction tape undergo accelerated aging tests in an electric oven at 212° F. for 16 hours. Thus you get a guarantee of maximum aging ability.

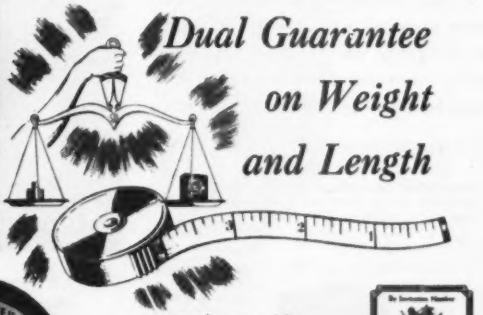
6



Every roll of Paramount Friction tape is sold with guaranteed minimum footage per roll plus . . . guaranteed weight. You are left in no doubt about what you are getting. And so you know you will cover the largest area most efficiently at the lowest cost.

7

To sum up, Paramount Friction tape, besides being made of finest materials, also undergoes rigorous pre-testing at the factory. Among the rigidly conducted tests are those for aging, adhesion and strength.



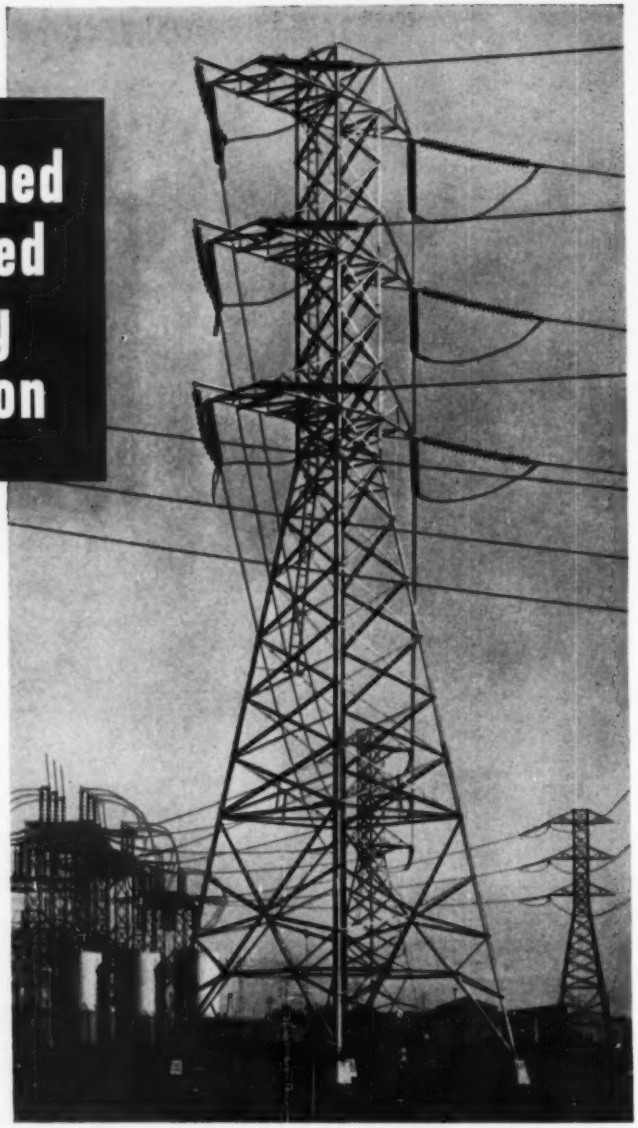
Manufactured by

Haartz-Mason, Inc.

WATERTOWN 72, MASS.

Member of
BUSINESS CHARACTER
Rice Leaders
of the North
Association

Towers Designed and Fabricated to Meet Any Load Condition



No matter what your transmission-tower requirements, you can be sure of good design and dependable fabrication when you entrust the job to Bethlehem. We have had long experience in designing and fabricating single- and double-circuit towers for service in all parts of the country, and for a wide range of load conditions. Our shops are well located, too, and are equipped for every phase of tower work, including galvanizing.

If you would like to know more about the work we are prepared to do in designing and fabricating transmission towers, please send your inquiry to the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

220 KV 90-deg-angle transmission towers at Pacific Gas and Electric Company's Moss Landing Steam Generating Plant, Moss Landing, Calif. Towers were designed and fabricated by Bethlehem Pacific Coast Steel Corporation, and are part of a 65-mile line extending from Moss Landing to Panoche. Conductors, 795,000 cm ACSR. Average span, 1100 ft. Average height of towers, 100 ft.

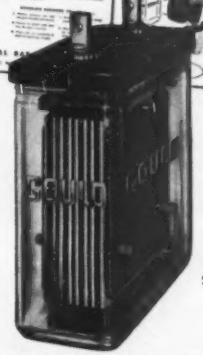
Transmission Towers

More Help Now Available to You with the . . . GOULD Plus-Performance Plan

New FREE Check-Chart for Battery Maintenance Men

Just what you need for your battery room! Establishes rules to follow, eliminates hit-and-miss maintenance methods, guides new help, reduces training time, assures continuous battery care, prolongs battery life, cuts accidents. Size 17" x 22". Printed on heavy stock and varnished for durability and easy cleaning.

Here is the latest addition to GOULD PLUS-PERFORMANCE PLAN service. Used in conjunction with the Plan's vast library of articles, bulletins, specifications, manuals, record cards, charts and graphs, this battery maintenance check-chart makes it even more possible to improve battery performance as much as 50%, increase output, save man-hours and cut costs. Like all GPPP material, it's FREE to users of the Plan.



Gould Planté—
The Aristocrat of
Stationary Batteries

Mail this Coupon Today

BATTERY MATERIALS ARE SCARCE—AND GETTING SCARCER EVERY MONTH! IF YOU NEED BATTERIES, LET US QUOTE ON YOUR REQUIREMENTS NOW.

GOULD
STORAGE BATTERIES

GOULD-NATIONAL BATTERIES, Inc.
Trenton 7, New Jersey

Always Use Gould-National Automobile and Truck Batteries

GOULD-NATIONAL BATTERIES, INC., Trenton 7, N. J.

Please send full information on the GOULD PLUS-PERFORMANCE PLAN including FREE check-chart for Stationary Battery maintenance.

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NO RADIO INTERFERENCE

NO CRACKING

NO PUNCTURE

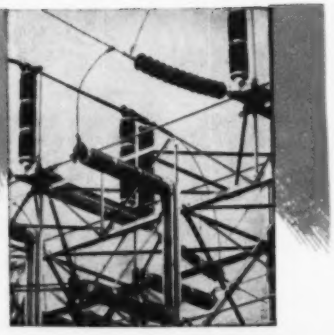
NO CLEANING

GREATER RESISTANCE TO STONES AND BULLETS

BETTER PERFORMANCE UNDER ARCOVER

LOWEST REPLACEMENT AND MAINTENANCE COST

The Lapp Station Post, incorporating the same design and performance characteristics as the Lapp Line Post, boasts an operating record unmatched by any other insulator for switch and bus support use.



THESE PERFORMANCE SUPERIORITIES HAVE BEEN PAYING OUT FOR SOME COMPANIES FOR 20 YEARS

Introduction of the Lapp Line Post and Station Post design made available to power companies an insulator in which shortcomings of conventional insulators were eliminated. Those companies willing at the beginning to "take a chance" on this "untried" design have had 20 years' experience to prove the superiorities of Line Post and Station Post performance. Companies which are now specifying Lapp Post insulators are assuring their systems long, trouble-free service which will add to operating profits for years to come. You can start earning this profit for *your company* by standardizing on Lapp Line Posts and Station Posts *now*.

LAPP INSULATOR CO., INC., LE ROY, N.Y.

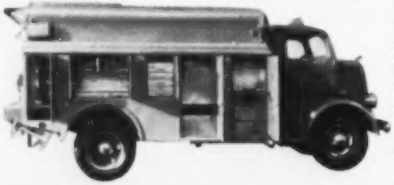
...RING... You can get all HOLAN Line Body Models with or without a crew compartment!

Model CL-112 (top) for light line work with a three-man crew,

Model CLC-138 has similar compartment arrangement plus a four-man crew compartment.

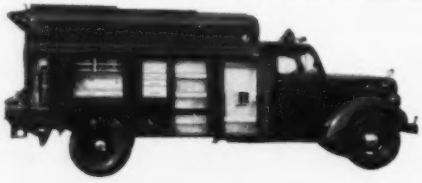
• Devote your entire line body to carrying tools, equipment and supplies . . . or carry your crew right along in a built-in four-man crew compartment. Whatever your procedure, Holan bodies meet the specifications . . . for light line work, medium line work, or extra heavy construction work.

Only Holan offers such a wide selection of line body models plus so many exclusive time and labor saving advantages.



Model CM-138 (top) for medium line work.

Model CMC-164 has the same compartment arrangement and a four-man crew compartment.



Model CH-156 (top) for heavy line construction and maintenance work.

Model CHC-182 has same compartment arrangement plus a four-man crew compartment.

The dependable name in Utility Bodies . . .

J. H. HOLAN CORPORATION

BODIES and ACCESSORIES for UTILITIES

4100 West 150th Street — Cleveland 11, Ohio

Compare

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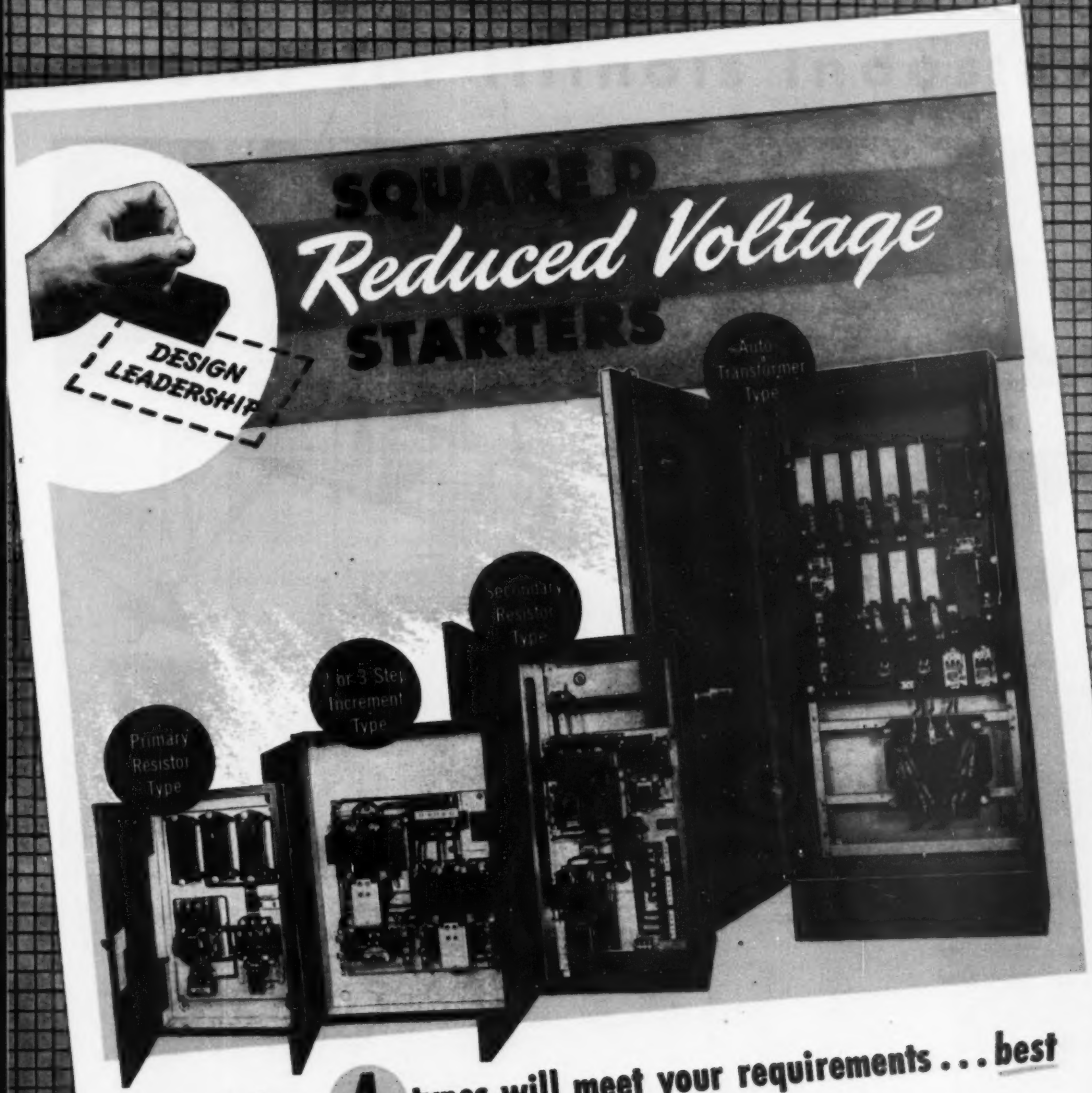
Baker Equipment Engineering Co. — 2401 Hutchinson Avenue — Charlotte, N. C.

Schetky Equipment Corp. — 1810 S. E. 10th Avenue — Portland 14, Oregon



One of these 4 types will meet your requirements . . . best

- Is minimum motor current inrush your primary consideration?
- Is it reduced starting torque? Or maximum smoothness in acceleration?
- Is cost an important factor?

With these four types Square D can meet any reduced voltage starter requirement—exactly.

***Write** for Reduced Voltage Starter Bulletins. They give complete details.*
Address Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

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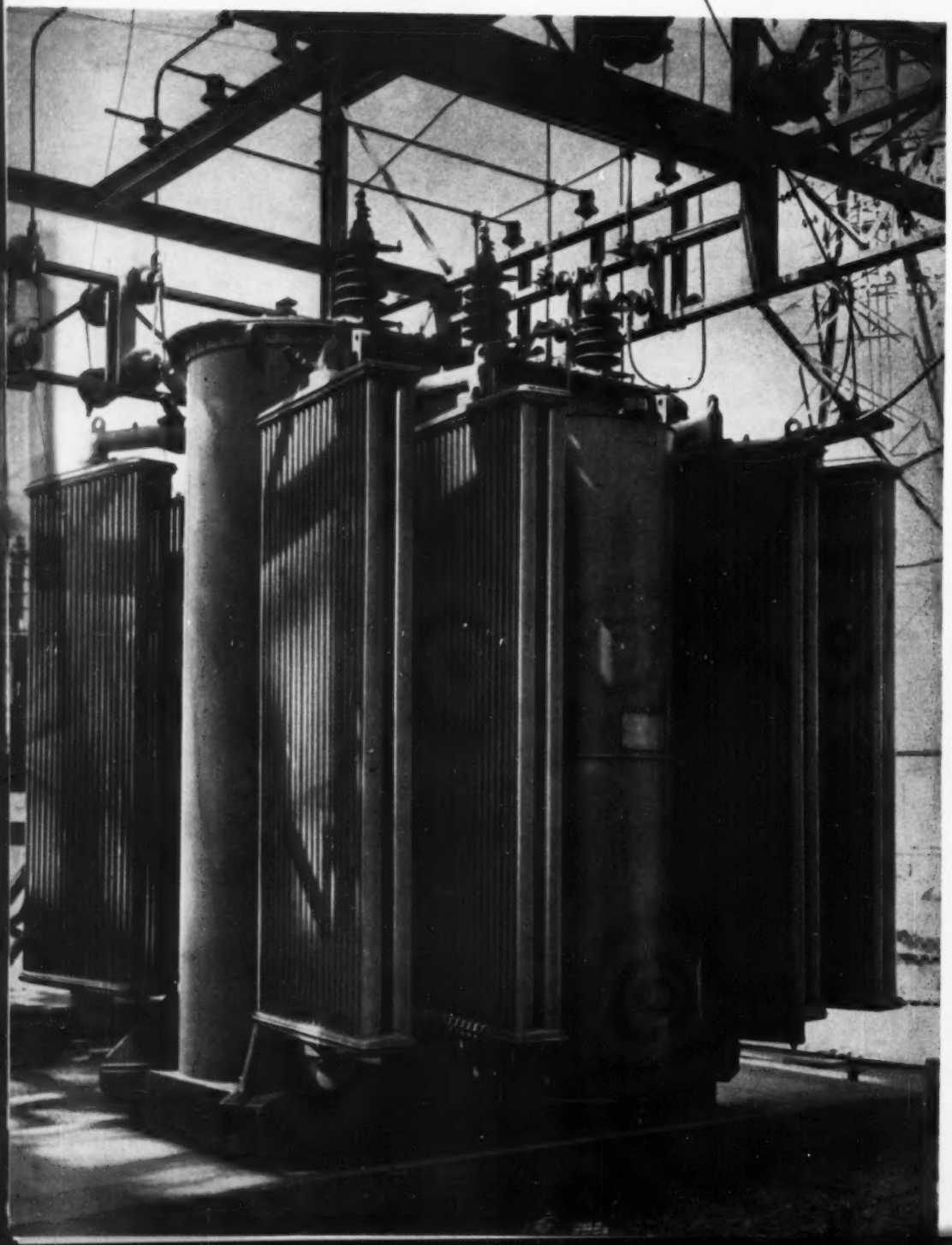


power for Illinois industry

Production in a large Illinois steel and wire plant gets a mighty boost from the power supplied by the substation in which this 3750 KVA three phase Kuhlman transformer is located.

The Illinois utility which selected this Kuhlman Power Transformer for this substation job is one of 15 of the country's largest power companies. Kuhlman is proud of the fact that more than two thirds of these fifteen companies are numbered among its regular customers.

Kuhlman hasn't gained the trust of such companies by accident. It has held its position only because the quality workmanship and solid construction principles which it began building into its transformers 58 years ago have continued to measure up. These are good reasons why you, too, can count on the reliability of Kuhlman Transformers. For your next transformer requirement, give the Kuhlman representative in your area a call.

KUHLMAN ELECTRIC

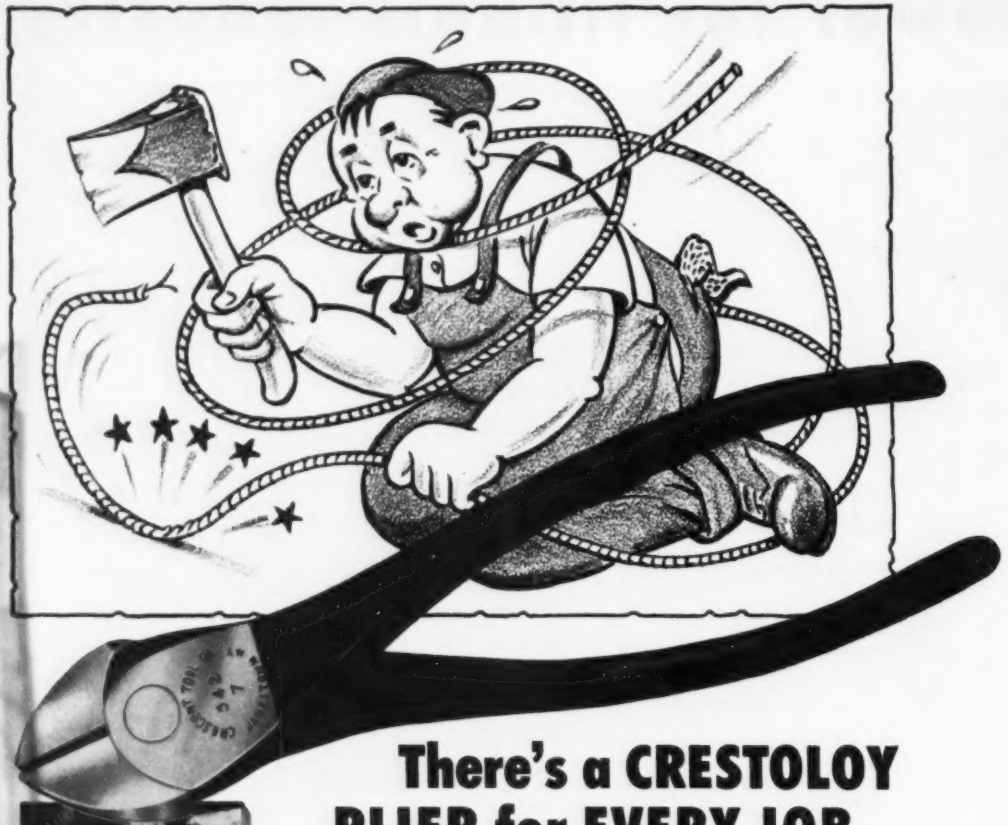
Kuhlman

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

The complete Kuhlman line covers power, distribution, dry type, Saf-T-Kuhl and specialty units. Write today for descriptive bulletins.

EXPORT REPRESENTATIVES: *International Standard Electric Corporation,* 67 Broad Street, New York 4, N.Y. Cable Address, Microphone, N.Y.

WHY DO IT THE HARD WAY? . . . . *by BUSTER*



There's a CRESTOLOY PLIER for EVERY JOB

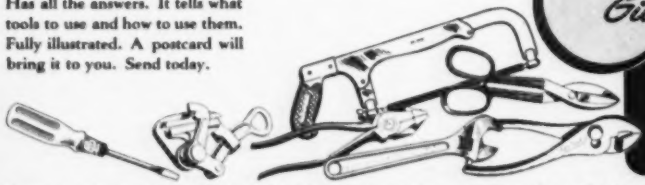
Apparently Buster has never studied the Crescent Plier display board at his hardware dealer's. If he had, or had read the Crescent book—"How to Use Hand Tools"—he would know that the right tool for this job is a pair of CRESTOLOY Heavy Diagonal Pliers. They're made of special steel, streamlined, with the right feel and cutting leverage for tough jobs. ▸ See your Hardware Dealer NOW.

FREE BOOK!

Has all the answers. It tells what tools to use and how to use them. Fully illustrated. A postcard will bring it to you. Send today.

CRESCENT TOOLS
Give Wings to Work

Sign of the Artisan
Symbol of Excellence

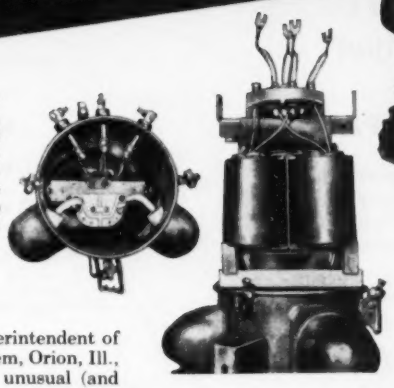


Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

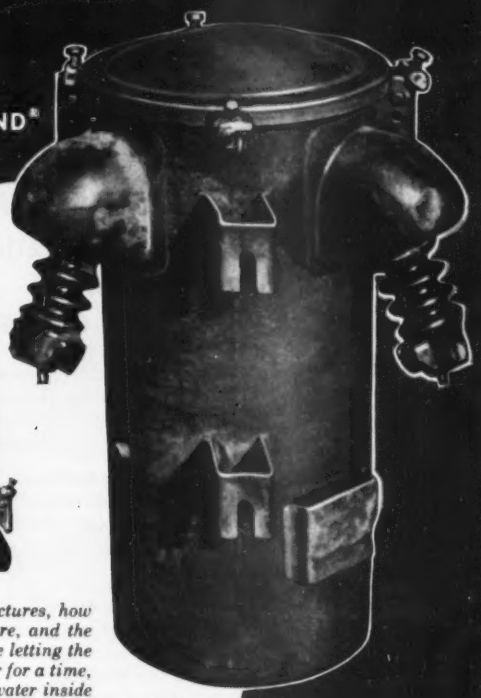
CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

FLOOD BATTERED...

...THEN BURIED IN MUD, THIS L-M ROUND-WOUND® TRANSFORMER IS READY TO GO RIGHT BACK TO WORK!



Battered by flood water that shattered the pole, and buried under mud and rocks, this L-M Round-Wound transformer suffered only minor damage—and there wasn't a drop of water or mud inside!



PHOTOS BY K. M. NORCROSS

K. M. Norcross, superintendent of Sherrard Power System, Orion, Ill., recently reported an unusual (and unintentional) test of the rugged construction of L-M Round-Wound transformers. Here is what he says about it:

"Last spring the Mississippi River reached its highest flood level in 20 years. Before dawn one morning the river went through a dike, taking with it one of our poles on which was mounted one of your 5 kva Round-Wound transformers.

"We never saw that pole again—until a month ago. A dragline cleaning out a drainage ditch 1500 feet away dug the transformer out from under 5 to 10 feet of mud and rocks. Two feet of the pole was still attached but was badly shattered, and the tank was badly scraped and battered—evidence of the terrific battle the transformer and pole had with the river.

"The internal condition was excellent—almost as though it had just come off the assembly line. The oil was gone and one bushing was chipped and loose—but there wasn't a drop of mud or water inside and it was obvious that the damage occurred when the transformer was dug out.

"Note, in the enclosed pictures, how clean are the coils, the core, and the inside of the tank. We are letting the core and coil out in the air for a time, just in case there is any water inside—and then we'll put it back on the line. I just thought you'd like to know how much abuse a Line Material transformer can take!"

(Signed) K. M. NORCROSS,
Superintendent

At L-M's request, the transformer was shipped to the Zanesville plant, where it was tested and found to be in perfect operating condition. The only work required was replacement of bushings, repainting the tank, and refilling with oil.

There's much more to L-M Round-Wound transformers than just rugged construction and flood-proof tank sealing. Ask the L-M Field Engineer to tell you about their superior performance characteristics and long life. Or write for bulletins. Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LINE MATERIAL
Transformers

RELY ON "ROUND-WOUND" BETTER ALL AROUND!

Now— L-M brings JEFFERY-DEWITT

JEFFERY-DEWITT INSULATOR CORPORATION *now a part of* LINE MATERIAL COMPANY

The Jeffery-Dewitt Insulator Corporation of Kenova, West Virginia, through acquisition by McGraw Electric Company, is now a part of the Line Material Company Division.

The business will continue operations with its present staff under the direction of W. L. Stinson. W. V. Swan, a member of the L-M sales staff, has been appointed manager of porcelain sales.

The acquisition offers advantages to both J-D and L-M customers. It is a further step in the successful growth of Line Material Co. and another addition to the broad service and fine line of products being offered by L-M to the electrical industry. The addition of this well-known company should result in better service and improved coordination in the supply of line construction materials and porcelain products and hardware.

J-D products will be available through L-M Field Engineers, sales offices, and warehouses along with L-M's extensive line of electrical utility apparatus, equipment, and materials.

W. V. (Bill) Swan, of L-M's Field Engineering staff, is now manager of porcelain sales.

New Operation offers advantages to J-D and L-M customers

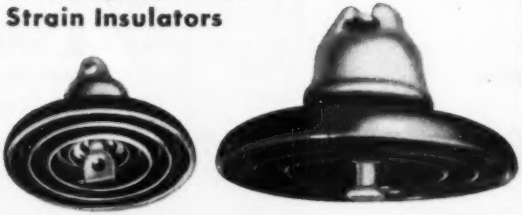
- L-M now offers a complete line of the finest quality insulators and hardware directly from its own plants.
- L-M's large staff of Field Engineers can now give users of J-D products better service, with more frequent calls and broader and more complete engineering service.
- With the coordination of products and shipments, customers should soon benefit by savings in ordering, receiving, checking and warehousing.
- The cooperation of L-M's sales, engineering, production, and operating departments will aid in the development and production of improved porcelain insulators and hardware.
- L-M Field Engineers have full information on the very extensive and complete J-D line now available to you through L-M's sales organization.

77

LM® J-D

you the complete "J-D" line of INSULATORS and HARDWARE

J-D Suspension and Strain Insulators



Suspension Insulators

Guy Strain Insulators

Spool Insulators

J-D Suspension and Strain Hardware

Suspension Clamps

Transmission Strain Clamps

A wide variety of Suspension Hardware

J-D Pin Type Insulators and Line Posts

Low Voltage Pin Type Distribution Insulators

High Voltage Pin Type Distribution Insulators

Line Post Insulators

J-D Switch and Bus Insulators

For information on types and sizes of insulators, hardware, and fittings you may require, ask the L-M Field Engineer who calls on you, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

HERE THEY ARE!

L-M's startling new type PHD

5KV HEAVY DUTY CUTOUTS

Up to 20,000 amperes interrupting capacity

Interchangeable doors—standard, heavy duty, and switch blade types

50 and 100 ampere doors fit your present PVD® cutouts.

Here is the first and only complete line of cutouts for high power capacity distribution feeders—a complete line of type PHD 5 kv cutouts in 50, 100, and 200 ampere ratings, and with interchangeable doors in each rating.

These cutouts provide high interrupting capacity *as you need it*, without the extra cost for needless high *continuous* current rating. They are guaranteed to operate through the full range of fault currents.

Now you can install one of these new L-M cutouts with standard duty doors. As feeder load requirements change and fault currents increase, just make a heavy duty cutout out of it, by hooking on the heavy duty door. Doors for the 50 and 100 ampere cutouts also fit your *present* PVD's—so you can change those into heavy duty cutouts with these new doors! Switch blade door, either stationary or indicating, converts cutout into a disconnect switch in just 6 seconds. Warehousing and stocking are all greatly simplified!

OUTSTANDING DESIGN FEATURES

- Housings wet-process porcelain, glazed inside and out.
- Hanger supports cemented into back of porcelain housings.
- All current carrying parts silver plated.
- New clamp type terminals with easily accessible large-head screws.
- Replaceable "bakelined" fuse cartridge tubes resist weathering and arcing.
- Spring-actuated flip-out device pulls fuse link down and out of tube, assuring instant separation of link parts, even with the smallest links and low fault currents.

1. standard duty door—1200 amperes interrupting capacity
2. heavy duty door—8000-5000 amperes interrupting capacity
3. switch blade door—100 amperes continuous current rating

L-M HEAVY DUTY CUTOUTS			
RATING	DOORS AVAILABLE	INTERRUPTING CAPACITY rms amperes 2.5 kv*	5 kv**
50 AMPERES	1. Standard duty, indicating	1,200 amp.	1,200 amp.
	2. Heavy duty, non-disconnecting	8,000 amp.	5,000 amp.
	3. Switch blade	100 amperes continuous current rating.	
100 AMPERES	4. Standard duty, indicating	3,000 amp.	3,000 amp.
	5. Heavy duty, non-disconnecting	14,000 amp.	10,000 amp.
	6. Switch blade	200 amperes continuous current rating.	
200 AMPERES	7. Heavy duty, indicating	20,000 amp.	15,000 amp.
	8. Switch blade	400 amperes continuous current rating.	

* or line-to-neutral 4160 or 4330 volts Gr. Y. ** or line-to-neutral 8330 volts Gr. Y.

Engineered for Safety

The lineman can remove the door completely, refuse and replace it, all with a switch stick. When door is open, all door parts are dead.

Get the Whole Story

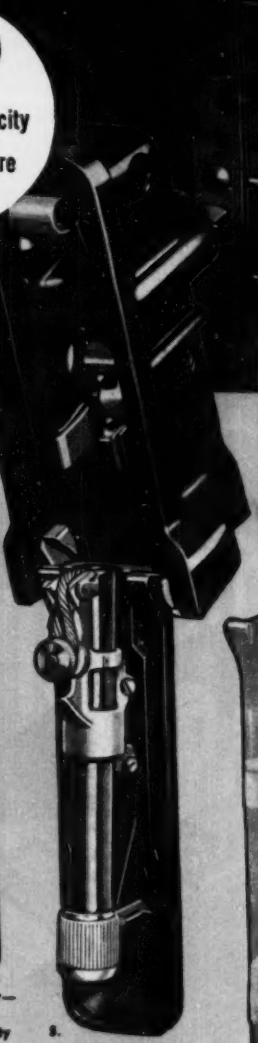
Ask the L-M Field Engineer for more information or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

PHD is a Line Material Trademark

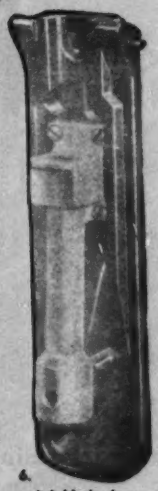
14,000 amperes interrupting capacity for **100** ampere cutout

20,000 amperes interrupting capacity for **200** ampere cutout

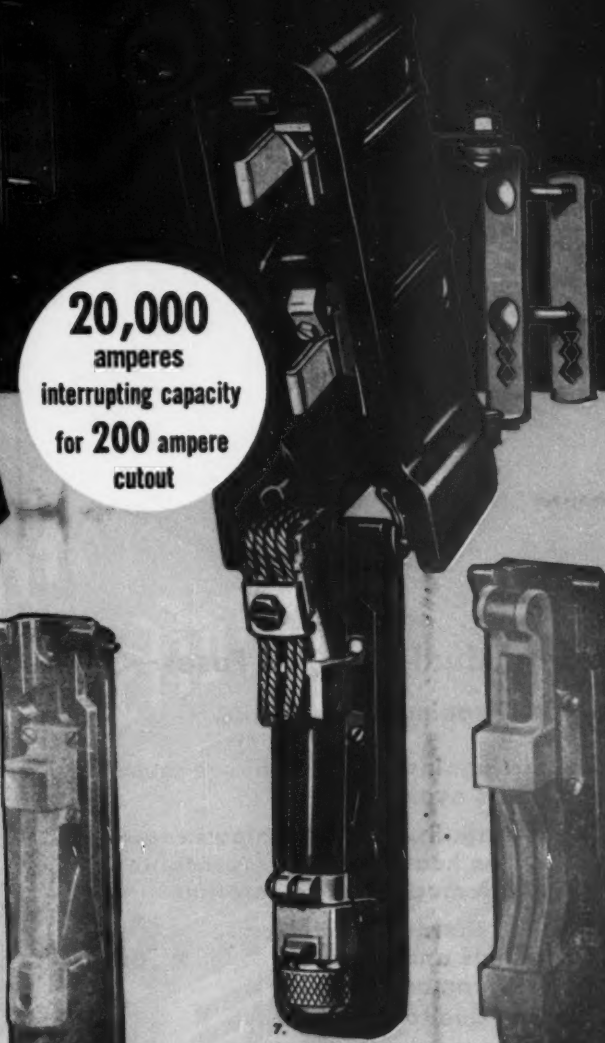
4. standard duty door—3000 amperes interrupting capacity



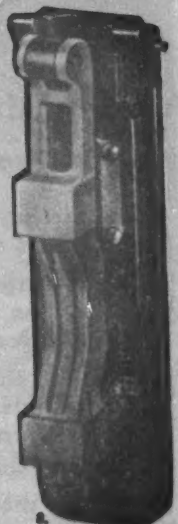
5. heavy duty door—14,000-10,000 amperes interrupting capacity



6. switch blade door—200 amperes continuous current rating



7. heavy duty door—20,000-15,000 amperes interrupting capacity



8. switch blade door—400 amperes continuous current rating

LINE MATERIAL

fuse cutouts

Complete Coordinated Equipment for Distribution Today

400 ampere disconnect switch in indicating position

Through the use of this new, higher-rated switch blade, the 200 ampere cutout can now be converted simply and quickly to a 400 ampere disconnecting switch for use on higher nominal current systems. Door can be closed with hinged blade in disconnect position below the box, giving positive indication that the line is open—a unique **L-M** feature.

548

WHEN THINKING OF ELECTRICAL PROTECTION KEEP IN [illegible]

with rare exceptions on Commerci[illegible]

Fusetron dual-element Fuses—

1* Protect against short-circuits.

2 Protect against needless blows caused by harmless overloads.

3 Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.

4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.

5 Protect motors against burnout from overloading.

6 Protect motors against burnout due to single phasing.

7 Give DOUBLE burnout protection to large motors — without extra cost.

8 Make protection of small motors simple and inexpensive.

9 Protect against waste of space and money — permit use of proper size switches and panels.

10 Protect coils, transformers and solenoids against burnout.

COUNT 'EM

DON'T RISK LOSSES

One **needless** shutdown . . .
One **lost** motor . . .
One **destroyed** switch or panel
One **burned out** solenoid . . .

May cost you far more than replacing every ordinary fuse with a Fusetron dual-element Fuse.

Mail the coupon now for complete information about the All-Purpose Protection of FUSETRON Dual-Element FUSES.

* Fusetron Fuses have high interrupting capacity shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

Bussmann Mfg. Co., University at Jefferson
St. Louis 7, Mo. (Division McGraw Electric Co.)

Please send me complete facts about FUSETRON dual-element Fuses.

*Name*_____

*Title*_____

*Company*_____

*Address*_____

*City & Zone*_____ *State*_____ 252

Facts from
MONTANA

"'CSP' Transformers cut failures 50 to 1"

"We have been using 'CSP' Transformers for the past ten years," says a Montana Utility. "One of our divisions now has about 1,000 'CSP' Transformers in service, and an equal number of the conventional type.

"Of all our 'CSP' transformers, we have lost but one from lightning. During this 10-year period, we have been losing an average of five conventional transformers per year. That means a ratio of approximately 50 to 1 in favor of the 'CSP'."

Old standards for judging transformers were discarded when the "CSP" (Completely Self-Protecting) Transformer was introduced. The "CSP" transformer, with both lightning and thermal protection built in, has slashed costs, cut maintenance, and improved service continuity. Its reputation has been won by performance in the field, in instances like this one—records that have made it first choice with utilities coast to coast.

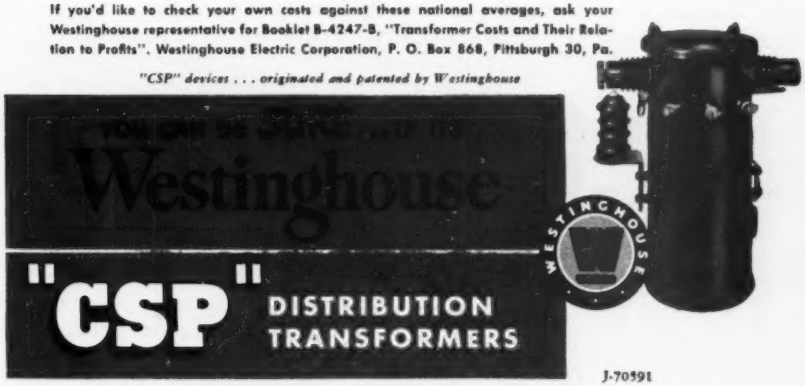
Installation and maintenance costs for Westinghouse "CSP" Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following:

NATIONAL AVERAGES

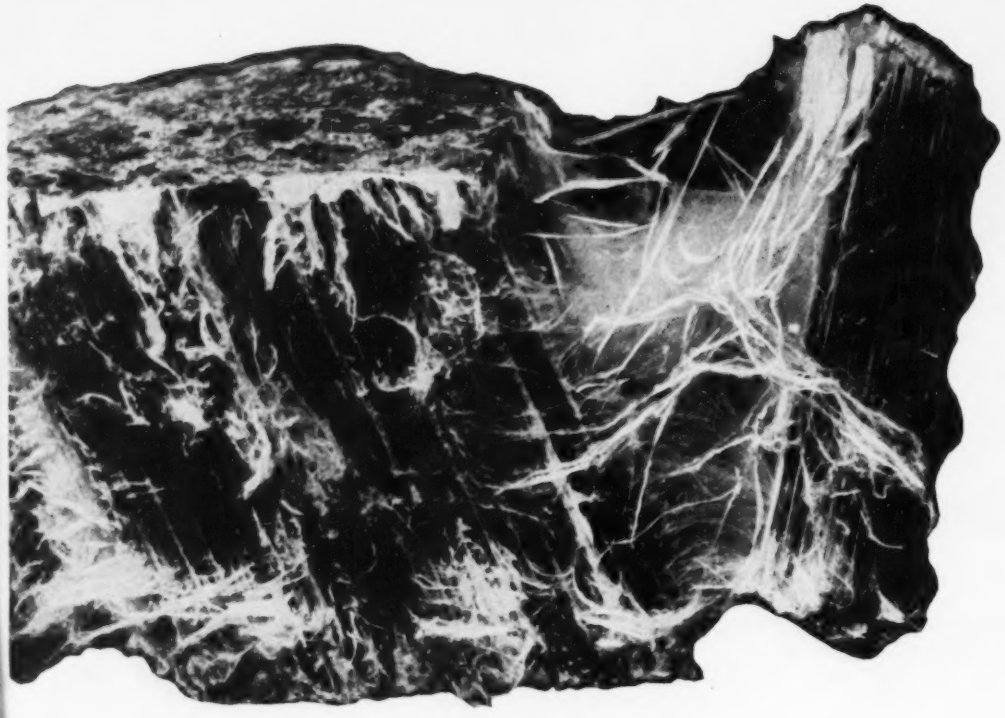
	"CSP"	Conventional
Installation Costs	$13.87	$24.74
Burn-out Rate	0.257%	1.005%
Fuse Outages	None	5.64% @ $6.52 per outage
Load Checks	Automatic	12.8%
Breaker Reset	1.02%	None

If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet B-4247-B, "Transformer Costs and Their Relation to Profits". Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

"CSP" devices . . . originated and patented by Westinghouse



J-70591



"Nature made Asbestos . . .
Keasbey & Mattison has made
it serve mankind since 1873"

Millions of years ago . . . even before the first Dinosaurs . . . raw Asbestos was being formed in the earth's cooling crust. Today, through the research of such pioneers as Keasbey & Mattison, Asbestos is serving mankind in thousands of ways . . . doing jobs as modern as this minute . . . being developed for tomorrow and industry's needs for years to come.

IN THE ELECTRICAL FIELD . . . there are Keasbey & Mattison Asbestos Textiles to meet every need:

ASBESTOS CLOTH for motor hoods, slot insulation, coil isolators, laminated and molded plastics.

ASBESTOS WOVEN TAPE for motor and field coils and power cables.

ASBESTOS THREAD for tying ends of heater cords and fixture wire.

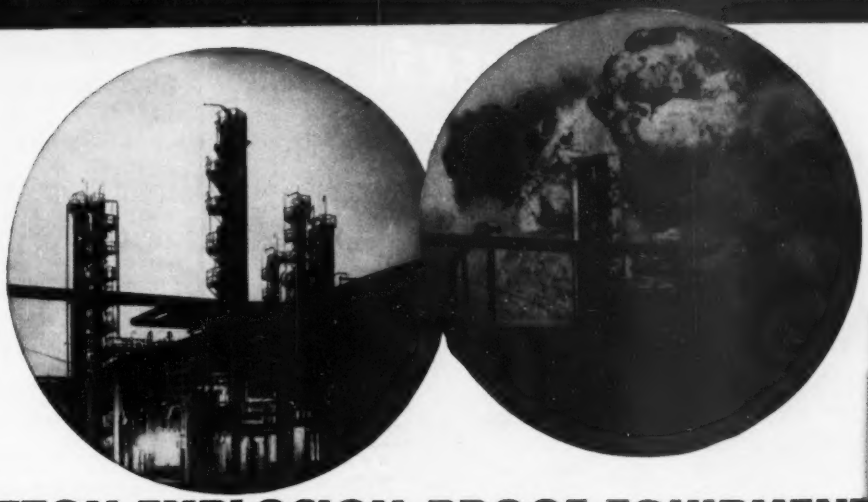
ASBESTOS BRAIDED TUBING for motor coil terminals, power cables and thermocouples.

All Keasbey & Mattison Asbestos Textiles are made to meet—and in many cases, surpass—A.S.T.M. Standards. We'll gladly send you complete information on any Asbestos Textiles upon request. Write, outlining your interests.

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

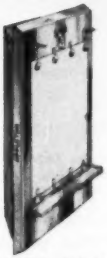
In Canada: ATLAS ASBESTOS CO., LTD., MONTREAL • TORONTO • WINNIPEG • VANCOUVER

ONE SPARK makes the difference!



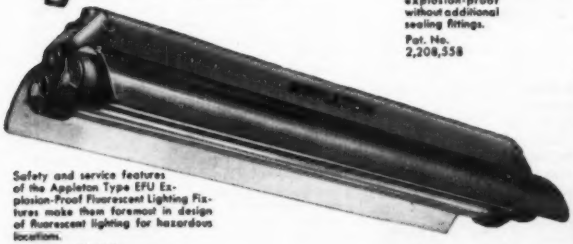
APPLETON EXPLOSION-PROOF EQUIPMENT

Type FSQX Explosion-Proof and Dust-Tight Plug and Receptacle with interlocking safety switch.



Type EFUX Explosion-Proof X-Ray Film Illuminator. For use in Hospital surgeries. Available in one- or two-gang models.
Patent Applied for.

The Appleton Seal-Line Switch Unilet is a combination switch housing and sealing unit. Completely explosion-proof without additional sealing fittings.
Pat. No. 2,208,558



Safety and service features of the Appleton Type EFU Explosion-Proof Fluorescent Lighting Fixtures make them foremost in design of fluorescent lighting for hazardous locations.
Pat. No. 2,392,202

When released in a flammable atmosphere, the tiniest electrical spark can reduce the greatest industrial plant to worthless ruin. To guard against this sudden disaster, Appleton explosion-proof conduit fittings and fixtures are expertly designed to completely seal off dangerous arcs that lurk in the wiring systems of chemical plants, oil refineries, hospital surgeries—wherever explosive or flammable vapors, dusts or gases are present.

Appleton Explosion-Proof equipment is easy to install and service. And among the hundreds of fittings and fixtures in the complete Appleton line is an explosion-proof fitting exactly suited to your needs.

No matter what your lighting or wiring requirements—explosion-proof or otherwise, specify Appleton, supplier to American builders for nearly half a century.

Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY

1705 Wellington Avenue • Chicago 13, Illinois

Branch Offices: NEW YORK, 50 Church St. • DETROIT, 3049 E. Grand Blvd. • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna St. • ST. LOUIS, 227 Frisco Bldg. • LOS ANGELES, 100 N. Santa Fe Ave. • ATLANTA, 724 Boulevard, N. E. • BIRMINGHAM, 429 Brown-Marx Bldg. MINNEAPOLIS, 305 Fifth St., S. • PITTSBURGH, 414 Bessemer Bldg. • BALTIMORE, 100 E. Pleasant St. BOSTON, 10 High Street • DENVER, 1921 Blake Street • PHILADELPHIA, 1017 Cherry Street CINCINNATI, 626 Broadway • HOUSTON, 717 M. & M. Bldg. • HAVANA, Cuba, Malecon No. 9.

Resident Representatives: Binghamton, Dallas, Indianapolis, Kansas City, Orlando, Milwaukee, New Orleans, Seattle, Portland, Ore.

Export Representatives: International Standard Electric Corp., 67 Broad St., New York 4, N. Y.

APPLETON ELECTRIC PRODUCTS

CRYSTAL VALVE ARRESTERS
Give Lasting Protection
REASONS WHY:
High Speed Multiple Arcing Unit
Crystal Valves embody time-proved spark gap units of multi-gap construction.
Oxidized Silicon Carbide Grain
Highly developed valve element is an exclusive feature of Crystal Valves.
Duplex Base Seal
Design feature prevents moisture from entering arrester despite severest weather conditions.

Month after month, year after year, Crystal Valve Arresters give you long lasting protection, plus all of the desired performance characteristics. Oxidized Silicon Carbide grain ideally suited for application as a valve element is found only in Crystal Valve Arresters. The true valve action is constant, unaffected despite extreme weather conditions. Split-second protection for your transformers, or other electrical equipment, is assured, preventing lightning "black-outs" from retarding service.

For efficient, reliable service, specify and use Crystal Valves on your power line equipment.

Write Dept. 1700 for latest technical data on lightning arresters and their installation. Ask for CV catalog. No obligation.

ELECTRIC SERVICE MANUFACTURING CO., PHILA. 32, PA.

CRYSTAL VALVE

LIGHTNING ARRESTERS

FUNDAMENTALS OF LIGHTNING PROTECTION

by

J. R. McFarlin, Vice President

ELECTRIC SERVICE MANUFACTURING CO.

Let's refresh our minds on the above subject.

Failure of transformers or other electrical equipment from lightning is always the result of failure of insulation—for instance, the flashing over of a bushing or the puncture of winding insulation; such failures are always the result of a *difference of voltage* existing across or between the flashed or punctured parts.

Since this is a recognized fact, there are two ways in which failure may be prevented:

a—By *limiting* the voltage that can be built up across insulation to values which the insulation can safely withstand.

b—By *balancing or equalizing* the voltage that is built up across insulation; by doing this, though the voltage to ground or to some other part may still be high, so long as it is balanced or equalized across the particular insulation, no failure of that insulation will occur.

The foregoing can be secured through the *proper choice* and *proper application* of lightning arresters.

Be sure to use arresters of the proper voltage rating for the circuit on which they are to be used; published ratings are given arresters in terms of "maximum permissible line-to-ground voltage" and since they are voltage actuated devices they should under no condition be subjected to voltages in excess of their maximum rms rating.

Two extremely important factors necessary for highly efficient lightning protection are their installation on equipment and their grounding. They should be located as close as possible to the equipment which they are used to protect; this means short leads from arrester to equipment and short leads to ground; remember that a lightning arrester is a voltage limiting device in shunt with insulation to be protected and that the length of this total shunt circuit (arrester line lead, arrester itself and arrester ground lead) should be kept to a minimum.

Where earth grounds form an element of the protective installation, it is desirable to provide as good grounds as are physically and economically possible. Lightning arresters may not always be grounded to earth direct; in many cases they are grounded to grounded transformer tanks, to a grounded secondary neutral, or to a multi-grounded common neutral; however, in all such cases an earth ground becomes a part of the installation and the remarks previously given on earth grounds still apply.

Yes, this is repetition of old information, but its proper application is still the means for securing the maximum protection that a good arrester can give.

advertisement

Here's a line of aluminum suspension and strain clamps that was designed from the start solely for use with aluminum conductors. The new Locke WATTSAVER design gives you all the loss-saving advantages of conventional aluminum clamps PLUS these exclusive features.

ALUMINUM KEEPERS (not ferrous) FOR GREATEST SAVINGS Aluminum clamps with *aluminum* keepers have just *half the magnetic losses* of aluminum clamps with *conventional ferrous* keepers. What's more, with aluminum keepers no lining is required . . . and corrosion resistance is much greater.

HEAVIER SECTIONS GIVE YOU HIGHER SAFETY FACTOR Larger, heavier sections in the design of Locke WATTSAVER clamps (see photograph) mean greater margins of safety in mechanical strength. And the fact that Locke WATTSAVER clamps are designed solely for use with aluminum conductors means a better conductor fit with either conventional or preformed rods.

YOU GET HIGHEST SLIP STRENGTHS Aluminum bodies with aluminum keepers possess greater coefficient of friction with aluminum conductors—an advantage of major importance.

A COMPLETE LINE OF LOCKE WATTSAVER CLAMPS This new Locke line of Aluminum Clamps is broad enough to provide you with the proper clamp for every size of aluminum conductor, bare or armored, within the "5 to 15" rule. Try them by specifying them next time you need aluminum clamps.

This 16-page technical bulletin on Locke WATTSAVER Clamps is yours for the asking. Gives you the complete factual story why you're the winner when you specify Locke Wattsaver Clamps for your lines. Send for your free copy today.

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

NEW IDEAS IN LIGHTING

from Guth . . . 50 years young and still pioneering

Year after year since 1902 the industry has looked to Guth for new and improved lighting fixtures. It's looking again in 1952.

Guth is preparing some pleasant surprises for you. Can't tell you much about them yet . . . some are still on the drawing board, others are being readied for production. But you can be sure all of them will mean better, more efficient lighting.

be looking for:

1 An extraordinary new Louvre
2 A Telescope Fixture that stretches your warehouse space . . . and your dollar
3 New and revised Fluorescent designs
4 An Incandescent line years ahead

Guth is now in R-L-M N. E. M. A. Fleurolier

LIGHTING

THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI

Leaders in Lighting since 1902

870

KEARNEY

HI-DIELECTRIC ROPE...

TREATED WITH U. S. NAVY TESTED FUNGICIDE

ASSURES HIGHER ELECTRICAL RESISTANCE!

Developed specifically for the power and telephone industries, Kearney Hi-Dielectric Rope is now better than ever! Treatment with a recently-discovered fungicide guarantees longer wear, higher electrical resistance.

Impregnated fibres of pure Manila provide higher dielectric strength — *and* insure longer service life through the elimination of mildew and rot.

Kearney Hi-Dielectric Rope contains no ingredients injurious to the hands.

Write TODAY for complete information on Kearney Hi-Dielectric Rope, including Safe Load values and proper care and maintenance.

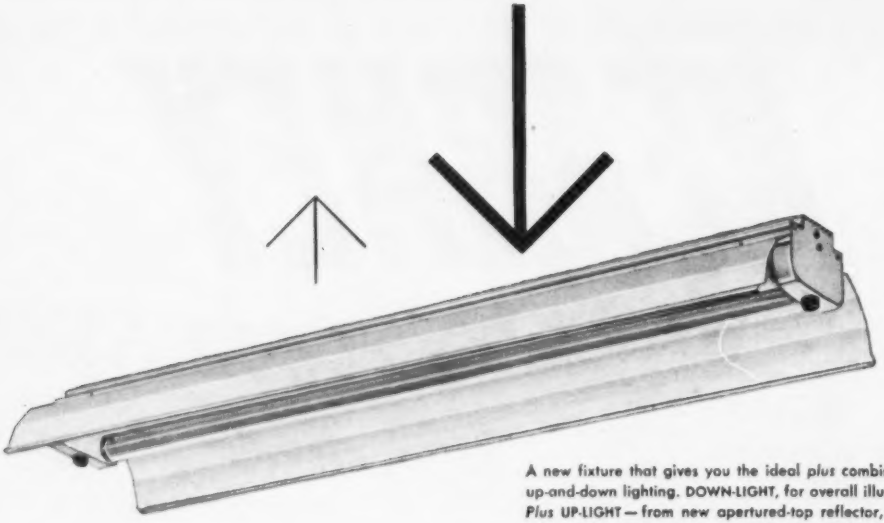
Rope is one of the most important tools on the truck. It must be strong, well-preserved and have high dielectric strength. For safety, for efficiency — specify Kearney Hi-Dielectric Rope.

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue, St. Louis 10, Mo.
Canadian Plant: Guelph, Ontario

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

184

KEARNEY PRODUCTS | **Better Construction... Safer Maintenance**
Through Constant Field Research and Engineering

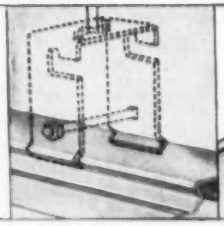


A new fixture that gives you the ideal *plus* combination of up-and-down lighting. DOWN-LIGHT, for overall illumination. *Plus* UP-LIGHT — from new apertured-top reflector, new all-white finish inside and out — to minimize brightness contrast (and give sufficient light for overhead maintenance). Result — a new high standard of illumination that enables workers to see easily and work better.

A more compact fixture, too, made possible by the use of the new G. E. small cross-section ballast. Long life assured by rigid adherence to the Miller 8-Point QUALITY standard. Engineered for easy installation and maintenance. Carries RLM label. Can be mounted individually or in continuous rows. Delivery — excellent.

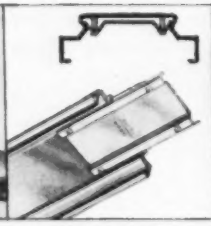
a new plus in industrial lighting

miller *50 FOOT CANDLER JR.*

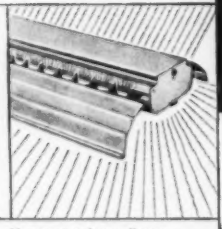


New all-white finish — baked enamel — RLM porcelain enamel.

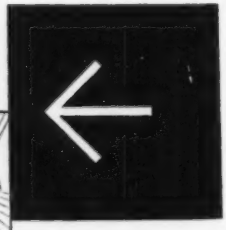
Flanged-top wireway channel permits clamp hanger mounting anywhere along entire length — simplifies installation.



New pressure-type connector for joining luminaries for continuous rows. No holes to drill.



New apertured-top reflectors, minimize brightness contrast — give sufficient up-light for overhead maintenance.



New small cross-section G.E. #89G343 ballast — streamlined wireway.

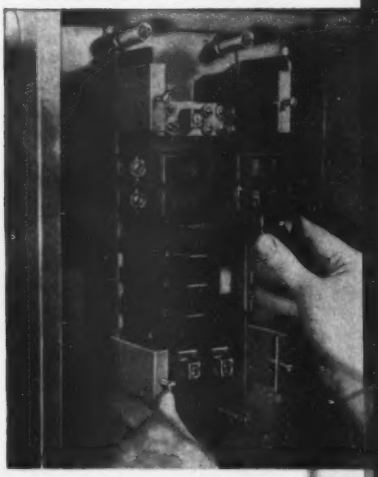
This, the husky son of our famous 50 Foot Candler, is the newest of a complete line of Fluorescent, Filament and Mercury fixtures for a wide range of industrial and commercial lighting requirements. Miller field engineers and distributors are conveniently located for nation-wide service.

THE miller COMPANY MERIDEN, CONN.
SINCE 1844

ILLUMINATING DIVISION: Fluorescent, Incandescent, Mercury Lighting Equipment

HEATING PRODUCTS DIVISION: Domestic Oil Burners and Liquid Fuel Devices

ROLLING MILL DIVISION: Phosphor Bronze and Brass in Sheets, Strips and Rolls



ANOTHER TALKING POINT IS THE BREAKER—Trumbull's new NLTQ Panelboard introduces the first *plug-in* circuit breaker with quick-make, quick-break operation. Other features: both *thermal* and *magnetic* protection . . . trip-free . . . pressure-type, silver-plated copper plug-in contacts . . . all ratings physically interchangeable. Adjacent breakers are on alternate phases—assuring balanced loads and circuits.

New insulating material

MAKES PANELBOARD SALES!

The base of this panelboard interior is made of *Plastisol* . . . the first time this amazing plastic material has been used for this purpose.

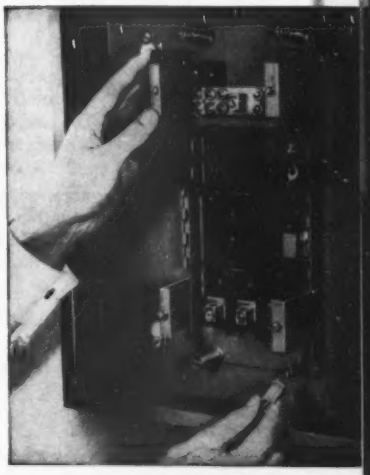
Here are some reasons for your recommending Trumbull's new NLTQ Panelboard to your customers.

Plastisol has very high thermal conductivity and is an excellent radiator of heat. Copper bus bars encased in Plastisol run 10% cooler than in open air!

SALES POINTS THAT OUT-SELL OTHER INSULATION

Other Plastisol advantages making it superior to all other types of insulation for this purpose include its ability to resist acid and alkali, high temperatures (not harmed at 212 F), tracking and carbonizing. It will not shrink or become brittle, even at minus 30 F.

Trumbull's Plastisol base is Underwriters' Laboratories, Inc. approved and endorsed by the Electrical Council.



YOUR CUSTOMERS WILL LIKE QUICK INSTALLATION—Interior is mounted in box by compression springs . . . which permit easy release for removal. Springs also permit lining up fronts regardless of uneven box installation. Trumbull NLTQ panelboards with lug or circuit breaker mains come in capacities up to 225 amperes in a range of 4 to 42 circuits. Write for Bulletin TEB-14.

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.

Sangamo J Meters

preferred by men who work with meters

Your meter superintendent and his men prefer meters that can be quickly and easily calibrated, saving costly man-hours for his company.

Men who work with meters *know*, that Sangamo J Meters, as received, seldom need any calibration to meet all generally accepted standards of accuracy.

Simple full-load and light-load adjustments—readily accessible from the front, exceptionally clear visibility, and easy removal of registers, are a few of the reasons why J Meters are favorites with meter testers everywhere! They're faster to test—easier to calibrate. An ordinary screwdriver is the only tool needed.

Economical replacement of parts is another of the reasons why the men who work with meters prefer J Meters. When advantageous, either the current or potential element may be replaced separately.

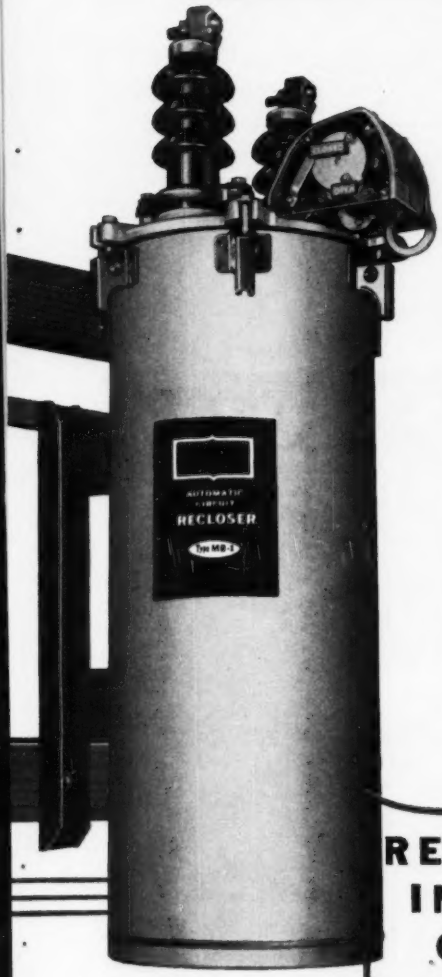
Only Measured Facts are Known Facts

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Sangamo J Meters have proved their ability to meet today's requirements and tomorrow's anticipated loads with sustained accuracy, economy of maintenance and troublefree performance.

280 Ampere Continuous Duty

High Interrupting Capacity



Check the Facts

on the new

AUTOMATIC
CIRCUIT RECLOSER

1. High Load Current - to 280 Amp.
2. High Interrupting Capacity
3. Improved fuse coordination - "lightning fast" (1-1/2 cycle initial tripping), followed by -
4. Selective delayed subsequent tripping. (Adjustable inverse time, or adjustable definite time).
5. Quick reset from lockout. Trip-free reset lever.
6. Improved precision mechanical timer - free from temperature error.
7. Mechanism can be mounted in tank, in any angular position, in 60 degree steps.
8. Coordinates with (several) secondary fuses.

REDESIGNED INSIDE and OUTSIDE

Nominal Service Voltage and Maximum Interrupting Ratings in RMS Symmetrical Amperes.

TYPE MB-1 (shown)	4.8 Kv.—up to 5000 Amp.	7.2 Kv.—up to 4000 Amp.

Continuous Duty — 100, 140, 200, and 280 Amperes

R&IE EQUIPMENT DIVISION

I-T-E CIRCUIT BREAKER CO.

GREENSBURG, PA.

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC RECLOSING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

It'll soon be 21!

For 20 straight years Internationals have been first in heavy-duty truck sales.

It will soon be 21. Another year will be added to International Trucks' heavy-duty leadership because truck operators who know hauling costs will *continue* to prefer the trucks that give them lower operating and maintenance costs, longer truck life.

If you are interested in these money-saving advantages, why not see your International Truck Dealer or Branch about the truck engineered for your job?

INTERNATIONAL HARVESTER COMPANY · CHICAGO

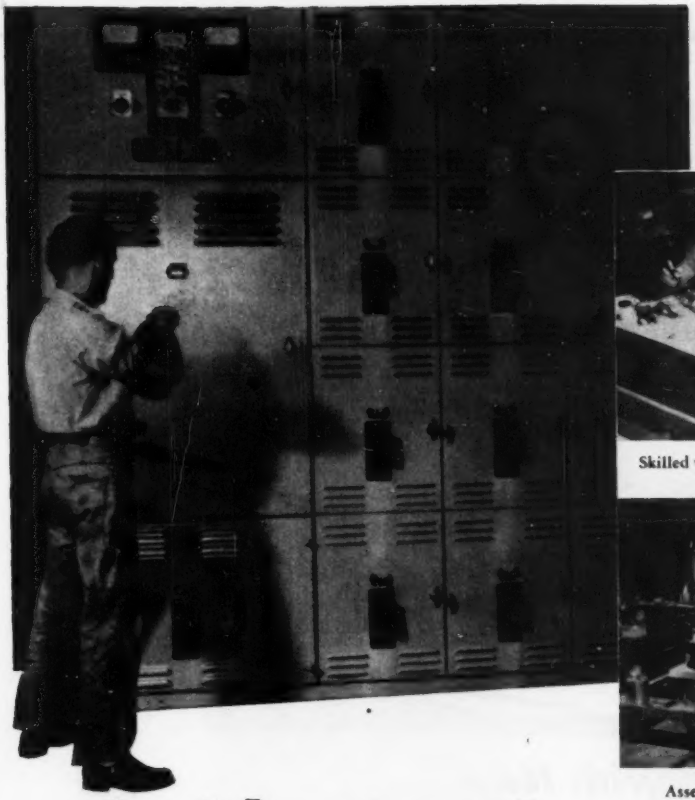
Check these exclusive advantages of Internationals:

- All-truck engines—exclusively for truck work—built in the world's largest truck engine plant.
- The "roomiest, most comfortable cab on the road"—the Comfo-Vision Cab designed by drivers for drivers.
- Super-steering system—more positive control, easier handling and 37° turning angle.
- Traditional truck toughness that has kept International first in heavy-duty truck sales for 20 straight years.
- 115 basic models . . . everything from ½-ton pickups to 90,000 lb. GVW ratings.
- America's largest exclusive truck service organization.

International Harvester Builds McCormick Farm Equipment and Farmall Tractors . . . Motor Trucks . . . Industrial Power . . . Refrigerators and Freezers

INTERNATIONAL TRUCKS

More than One Million Now on the Road



Final assembly of custom-built, low voltage, metal-clad switchgear.

Skilled workers assemble precision instruments.

Assembling Duo-Roll air break switches.

Workman wiring large air circuit breaker.

inside story!

Last April we opened an additional plant in Bethlehem, Pennsylvania. It is not only our newest but our largest. Because of this, we've been able to greatly increase our production of the precision-designed, dependable electrical equipment for which Roller-Smith and Elpeco have been noted since the early 1900's. We are happy to be in a position to supply increased amounts of equipment at a time when it is so badly needed and do it in a relatively short time. Despite universal material shortages and our greatly increased production you can be sure, that we . . . on the "inside" . . . are maintaining our same high standard of quality. If you need superior electrical equipment, either for yourself or as part of a defense order, contact us at once. We can't promise everything you might need, but perhaps we can help solve some of your particular problems in a surprisingly short time.

ROLLER SMITH

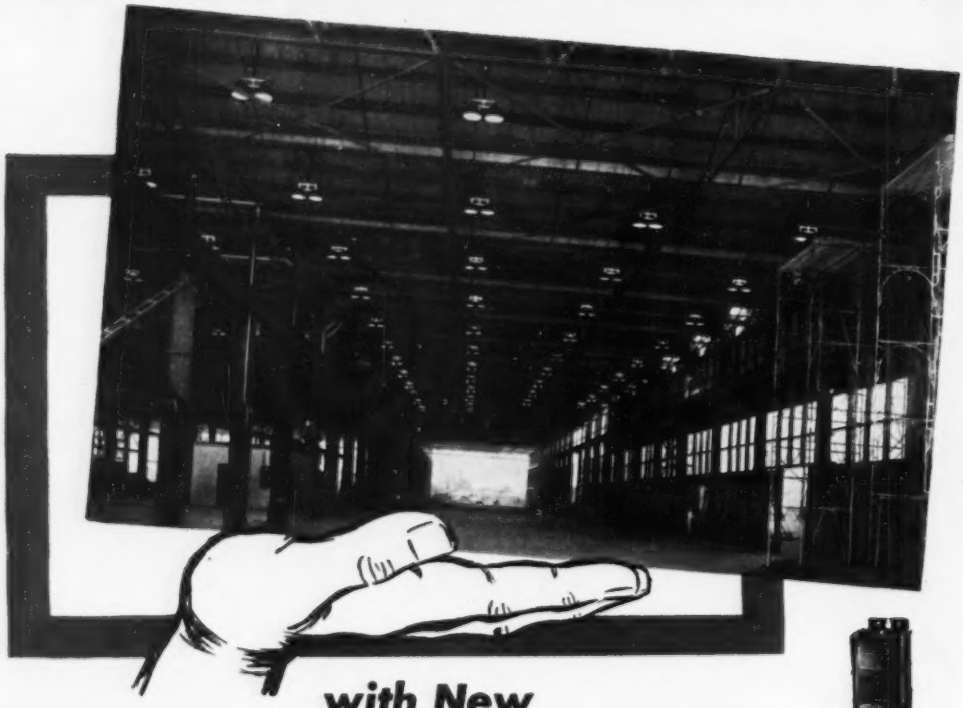
ELPECO

ROLLER-SMITH CORPORATION
BETHLEHEM, PA.

ROLLER-SMITH

ELPECO

KEEP LIGHTING EFFICIENCY UP!



with New JEFFERSON TRANSFORMERS

For Mercury Vapor Lamps

• Correctly and specifically designed for modern lighting service—Jefferson Transformers provide the proper starting and safe operating voltage and current for long-life, lowest cost lamp operation. The Jefferson accuracy of design controls the voltage and current to uniform predetermined specifications so vital to satisfactory lamp performance.

Designed by transformer specialist engineers and by a company that has devoted over 35 years to this one type of product — these transformers keep your mercury lamp lighting efficiency up and maintenance down. They are designed to meet the specifications of leading lamp manufacturers.

Both the single and two-lamp Transformers have *three* primary taps so a close match with the voltage of circuit to which lamps are connected can be selected for best results.

Wiring compartments of Indoor Types are roomy, ½-in. and ¾-in. knockouts provided and fittings at top and bottom for conduit and for suspension installation.

Our new Bulletin 521-5 includes complete data on indoor and outdoor transformers. Copy will be mailed on request.

Jefferson Transformer for wall, post, ceiling, pendant or messenger wire mounting.

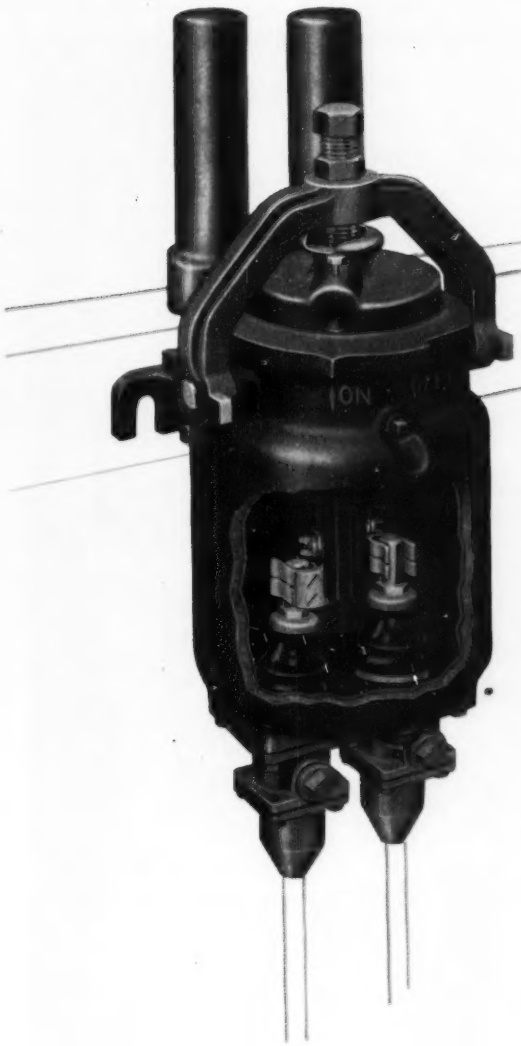
Two-lamp Transformers serve two lamps, provide many savings in first cost, wiring and installation.

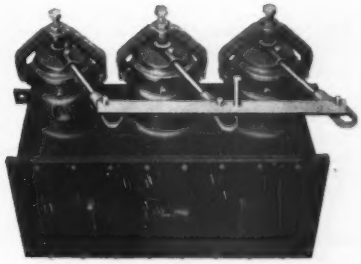
Weatherproof outdoor type for lamps used in lighting plant areas, boundaries, building fronts, etc., suitable for attaching to wall or post, or installed on pole top by means of an Adaptor.

JEFFERSON ELECTRIC COMPANY • Bellwood, Illinois

IN CANADA: Canadian Jefferson Electric Co., Ltd., 384 Pape Ave., Toronto, Ont.

CAST STEEL TANK (HERMETICALLY SEALED—OIL FILLED) PROTECTS MEN AND EQUIPMENT BY SAFELY WITHSTANDING HIGH PRESSURES OF HIGH VOLTAGE FUSE CLEARING A HEAVY SHORT CIRCUIT





"FC" OIL FUSE CUTOUTS

2500 — 5000 — 8000 VOLTS

In addition to the main purpose—a pressure tight enclosed fuse—the device serves as a full load break oil switch. The gang operating mechanism provides for three phase sectionalizing. The switching contacts are Beryllium copper. Fuse links are simple and inexpensive, easily replaceable in the carrier on the removable cover of the cutout tank.

Welded steel boxes with cutouts on top, enclose connections to feed and load circuits.

Bulletin CA50 gives data and prices. Write for a copy or ask your representative.

G & W "Forethought" CD1-5 shows how "FC" cutouts are combined with "BAL" oil switch. Send for your copy, there is no obligation.

G & W ELECTRIC SPECIALTY CO.

7780 Dante Avenue, Chicago 19, Illinois

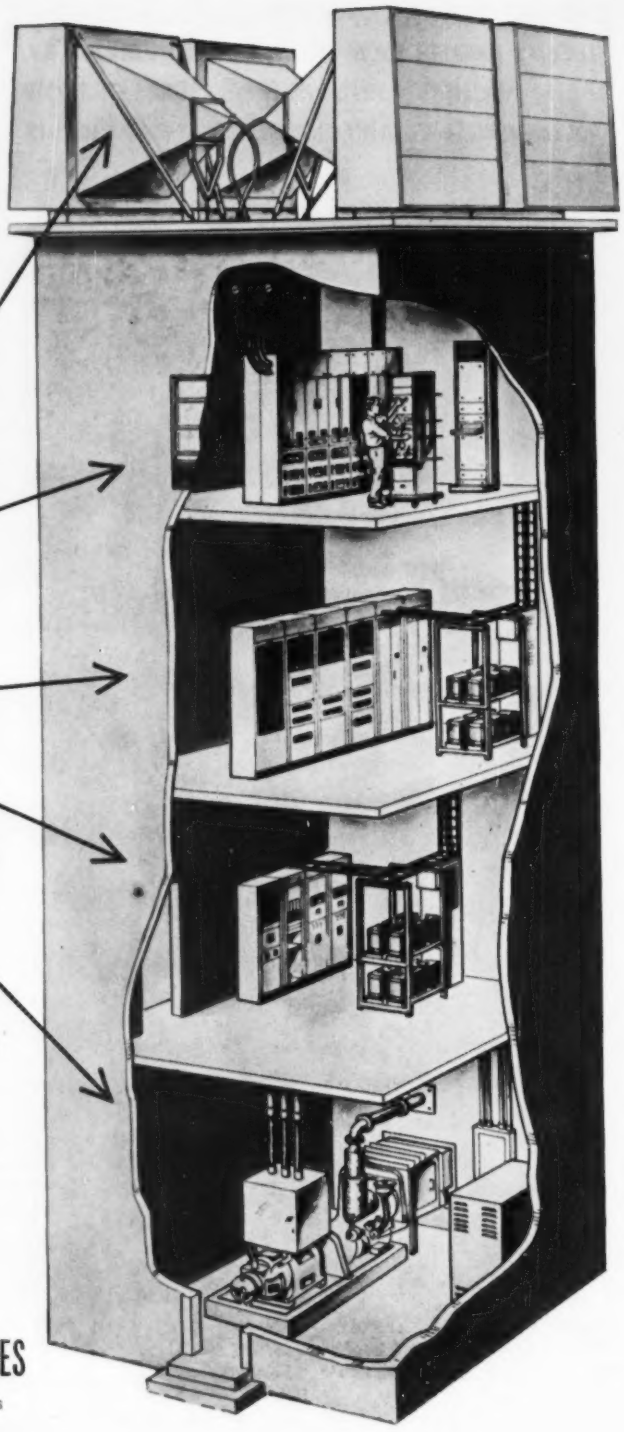
Cable Terminating, Connecting and Sectionalizing Devices

Representatives in principal cities of U. S. A.

In Canada—Powerlite Devices, Ltd., Toronto and Montreal

What's inside a *Radio-Relay* station?

Because microwaves travel in straight lines and the earth is round, there are 123 stations on the transcontinental television route between Boston and Los Angeles. This view of a typical unattended station shows the arrangement of the apparatus which amplifies the signal and sends it on.



ON THE ROOF are the lens antennas, each with its horn tapering into a waveguide which leads down to equipment

ON THE TOP FLOOR, where the signal is amplified, changed to a different carrier-channel and sent back to another antenna on the roof. Here are testing and switching facilities. Normally unattended, the station is visited periodically for maintenance.

ON THE THIRD FLOOR are the plate voltage power supplies for several score electron tubes.

ON THE SECOND FLOOR are filament power supplies. Storage batteries on both floors will operate the station in an emergency for several hours, but

ON THE GROUND FLOOR is an engine-driven generator which starts on anything more than a brief power failure.

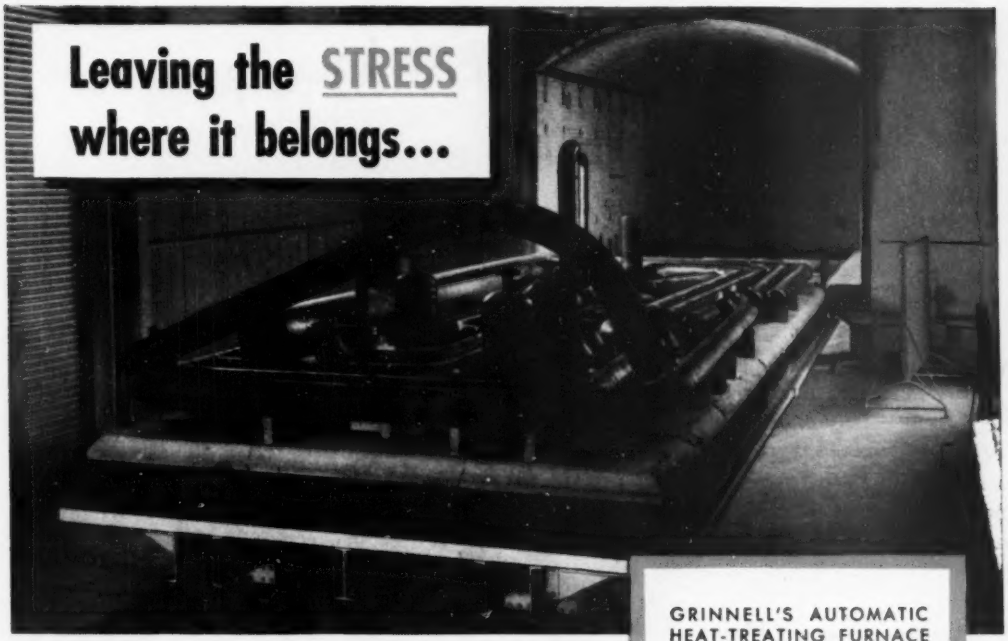
Anything that happens—even an opened door—is reported to the nearest attended station instantly.

Coast-to-coast *Radio-Relay* shows again how scientists at Bell Telephone Laboratories help your telephone service to grow steadily in value to you and to the nation.

BELL TELEPHONE LABORATORIES

Improving telephone service for America provides careers for creative men in scientific and technical fields.

Leaving the STRESS where it belongs...



Stress relieving prefabricated piping with highly developed equipment and special techniques is one reason why exacting specifications are met with

GRINNELL PREFABRICATED PIPING

Grinnell received an order recently for stress relieving prefabricated piping to these specifications:—

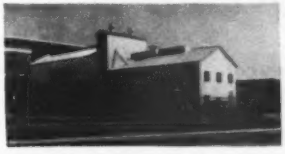
> "All fabricated pieces shall be normalized and drawn by heating to a uniform temperature of 1700°F (plus or minus 25°F). This temperature shall be maintained on a basis of one-half hour for each quarter inch of wall thickness of the heaviest pipe in the furnace charge followed by air cooling not less than 600°F. All pieces shall then be reheated to 1425°F and held at temperatures as above. In no case shall the time be less than 2 hours . . . Cool at a controlled rate not to exceed 200°F per hour until 600°F is reached . . ."

Grinnell, of course, met these specifications precisely. In fact, fabricating industrial piping today demands the *maximum* in versatility and precision.

Modern power plants, for example, need piping of heavy cross-sectional area and definite alloy composition to provide high temperature stability, resistance to creep and graphitization. Chemical and oil refining processes, on the other hand, must have piping of high chrome alloy to impart strength at high temperatures, resist corrosion, withstand impacts at low temperatures. Heat-treating often is the only answer — either to restore properties affected during fabrication, or improve original properties.

GRINNELL'S AUTOMATIC HEAT-TREATING FURNACE

performs with positive efficiency. This versatile stress-relieving unit, measuring 12 by 12 by 40 feet and using gas or oil or both as fuel, was designed to give full program control for the entire range of working temperatures. It provides instrument control of rate of rise in temperature of the charge, length of time for holding at the predetermined temperature level, and cooling rate. Two recording controllers are provided for the furnace and a separate 6-point recorder registers the temperatures of the charge simultaneously during the treating cycle.



Exterior View of Building

In heat-treating, as in everything else for piping, Grinnell has the experience and the costly equipment to fully protect large piping expenditures. That is why it will always pay you to call on Grinnell for *all* of your piping needs.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company Inc., Providence, Rhode Island • Sales Offices and Warehouses in Principal Cities

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies Industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco humidification and cooling systems

A Statement by Anaconda on the Copper Situation

MANY users of copper have vital decisions to make . . . usually in connection with the present defense-induced shortages of copper and aluminum. This statement is an effort to remove the smoke screen surrounding the copper picture . . . to wipe away the confusion caused by too much talk supported by too few facts.

Substitution poses problems – Industry has been urged to substitute aluminum and other materials for copper. In some instances this may be logical and practicable. In many others it is difficult, if not impossible. But – before making *any* long-term decisions that may cost a great deal of money in engineering, new plant facilities or rescheduling of production operations – one should know the facts about the future of copper.

New Anaconda projects – The first major increase in copper production will come from Anaconda when the Greater Butte Project and the new Sulphide Plant at Chuquicamata, Chile, begin operations this spring. By 1953, these two projects should raise present levels of copper production by about 95,000 tons yearly.

Toward the close of 1953, Anaconda's new Yerington project in Nevada is expected to start producing at an annual rate of 30,000 tons. By then, Anaconda will be adding to the present yearly copper supply at the rate of about 125,000 tons.

Other new projects – During 1954-55 still other new projects in the U. S. and friendly foreign countries will further augment the increasing copper supply. All told, it is estimated that by 1955, not less than 450,000 tons of copper could be produced annually – over and above present production levels.

Accordingly, in 1955-56, domestic production plus imports could bring the U. S. copper supply to 1,800,000 tons yearly. This would represent an increase of about 20% over present levels. Based on historical comparisons, and barring a large-scale shooting war, this amount of copper could support a Federal Reserve Board Index of Industrial Production of 270, an increase of 24% over the present, and 45% above the first half of 1950.

• • •

These are the 'things to come' in copper. On the basis of the facts there is no necessity for considering long-range substitution of other materials for the red metal.

52320A

ANACONDA
COPPER MINING COMPANY

The American Brass Company
Anaconda Wire & Cable Company
International Smelting and Refining Company
Andes Copper Mining Company
Chile Copper Company
Greene Cananea Copper Company

PRODUCERS OF: Copper, Zinc, Lead, Silver, Gold, Cadmium, Vanadium, Superphosphate, Manganese Ore, Ferromanganese.
MANUFACTURERS OF: Electrical Wires and Cables, Copper, Brass, Bronze and other Copper Alloys in such forms as Sheet, Plate, Tube, Pipe, Rod, Wire, Forgings, Stampings, Extrusions, Flexible Metal Hose and Tubing.

ALLIS-CHALMERS
INSTRUMENT
TRANSFORMERS

★Indoor Potential, 200 va, fused or unfused, Type PD. Ratings up to 14,400 volts.

Standardize

AND SAVE!

OVER 400 RATINGS FIT YOUR DESIGN NEEDS

YOU CAN SAVE valuable time and money by standardizing on Allis-Chalmers instrument transformers. Over 400 ratings in current or potential transformers or metering outfits are available to serve virtually every one of your transformer needs. You can select a dry-type, oil or compound-filled unit, depending on the transformer rating, application, or location indoors or outdoors. Transformers are of wound, bar or through types.

Each is designed and built to meet ASA standards. And every Allis-Chalmers transformer has the best combination of engineering and materials that 50 years of experience can provide. Thousands are now in service with excellent operating records. All are liberally designed for long service and built for quick, easy mounting.

For top quality, wide selection and quick delivery in instrument transformers see your Allis-Chalmers district office or dealer today. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for full facts. A-3519

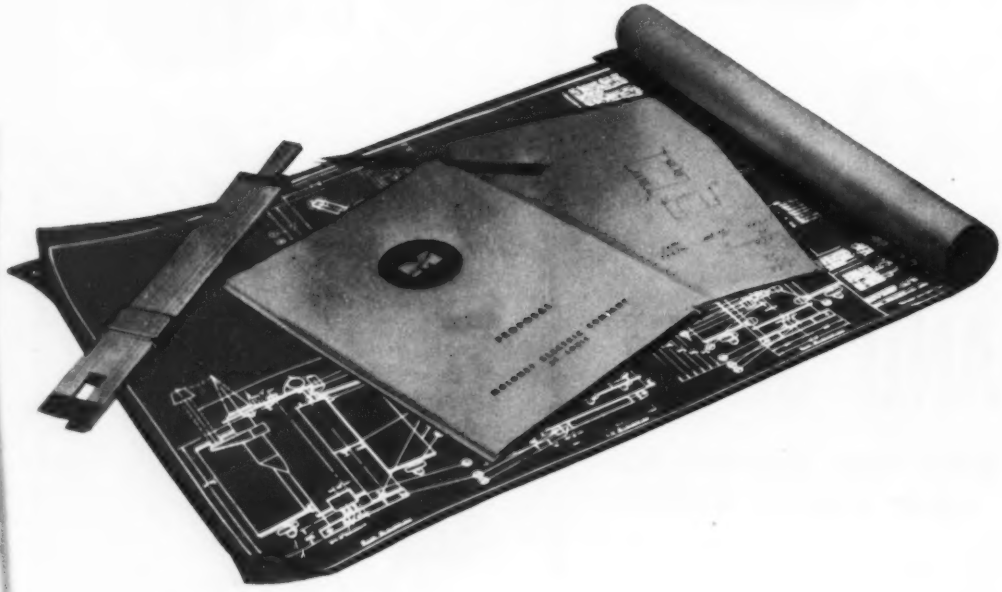
★Outdoor Potential, for heavy-duty metering service, Type SPW. Ratings up to 69 kv.

★Indoor Current, for heavy-duty metering, Type K3E. Ratings up to 15 kv.

★Outdoor current, for accurate heavy-duty metering, Type KO. Ratings up to 15 kv, 10 to 800 amperes.

ALLIS-CHALMERS

MOLONEY *Better Performance* is put in writing *FIRST!*



MOLONEY engineers put your specifications, plus over 50 years of engineering experience, into a formula *on paper* first.

This formula, followed through design and fabrication, results in a transformer, built to your needs, that is test-proven before it leaves our factory. Unexcelled experience, personnel and facilities all combine to give "Better Performance" when you specify Moloney Transformers.

ME 52-7

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers Step Voltage Regulators • Unit Substations

MOLONEY ELECTRIC = BETTER PERFORMANCE / GREATER RELIABILITY / LESS MAINTENANCE

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

Utility and Industrial Cooperation for Profit

Capital expenditures by all manufacturing companies topped $11 billion in 1951 and plans call for $13 billion in 1952. For the five-year period 1951 through 1955 preliminary plans call for outlays of $50 billion. More than half of this will go for increased capacity.

In these expansion programs we find about half of the industries use process steam in addition to large amounts of electric power. If the utilities will furnish steam as well as power, there is a large potential field for service and profit. The only way a utility can stay in business is to earn a fair return upon the facilities it operates to supply service. If steam must go with electricity, then it should be included and both utility and industry will gain thereby.

The Atlantic City Electric and the du Pont companies have tested this kind of service for more than 20 years. At the Deepwater plant, built in 1928, electricity and process steam are generated for use in the du Pont Chambers Works.

This experiment has been so successful that another agreement has now been reached for steam and power for the du Pont Repauno Works near Gibbstown, N. J. (See Page 94). Here as in the first instance the power station being built for operation by the Atlantic City Electric Co will have a unit for the sole use of the industrial operation. Obviously this plant will, like Deepwater, be integrated with the power system.

Perhaps the most unusual feature in this plan, other than that the power company was willing to do the job, is the joint supervisory committee. Matters of operating economy are developed by this group. Such items as fuel purchasing are included in their activities to assure minimum operating and maintenance expense.

In an arrangement of this kind, the utility makes a reasonable return on investment for its stockholders and secures economical energy when an excess is available. The industry gains experienced management and lower cost power and steam than would otherwise be available.

Since $30 billion of new manufacturing plant facilities will be added in the next three years, there must be room for many cooperative power and steam arrangements. Selling service is the business of the electric utilities. This service to industry is worth careful consideration.

Further Opportunities for Power Salesmen

A new program of the Pennsylvania Power & Light Co is an outstanding example of expanded opportunities industrial power engineers have in the defense effort by helping industry utilize electric service more efficiently. The new activity of this company is outlined in a booklet entitled "Production for Freedom" which pledges its industrial representatives to "help industries modernize every process and procedure that can benefit production-wise through the efficient application of equipment, materials, manpower and methods."

The booklet states that, "This nation, in mobilizing its economy to make America more productive and more secure, is helping preserve freedom over the entire earth. By making available the necessary power facilities, the electric utility industry has a key role. These facilities are vital to industry in maintaining production and expanding industrial capacity.

"Along with providing sufficient electric power for the defense effort, there is also a great opportunity for power company personnel to support the defense effort by helping industry utilize electric service more efficiently. As all who are closely associated with the mechanization and electrification of industry know, only the surface has been scratched in greater productivity. There are endless opportunities ahead for American industry to produce more goods . . . faster! cheaper! and better!"

"Production for Freedom" is a positive approach to America's and the world's problems. What greater opportunity could a power salesman have?

Can You Use This Idea?

Cooling water is required in huge quantities for condensing purposes in steam power plants, and it can be used over again only after some of the heat put into it by the condensed steam is taken out or dissipated. One potential way of removing heat from condensing water discharge is to let it be the heat sump from which heat pumps could derive the low level heat they need. Condensing water could be piped to an area where space heating is required, and the heat-pump pickup coils could be immersed in the pipes rather than in the ground. Utilities would get their condensing water refrigerated free (after spending plenty of money for the piping systems) and get the added electric revenue from the heat-pump owners who do the refrigerating incidental to the step-up in temperature. A dozen company officials will brush the suggestion aside as a ludicrous idea. One will do some figuring on it to sate his aroused curiosity.

Outdoor Plants Need Paint for Beauty

Architects are generally doing a good job in rendering housed power plants presentable items on the landscape. The graduated contours, the stately stacks, and the wall-surface materials are all tools they can use adroitly once the equipment designers have given them an advantageous disposition of the machinery.

Outdoor plants are different. They are looking more and more like the oil refineries that really set the pattern for unhoused equipment. Regardless of what the oil refiners do about keeping their plants respectable in appearance, the utilities should win and hold public favor by maintaining theirs in sightly and attractive condition. That is going to mean frequent painting. Not only should the annual average upkeep of the painted surfaces be included in the plant cost analysis, but consideration needs to be given to the durability of the paint.

It has to be more than merely an outdoor metal paint that will weather well. There will be local areas and joints where it may be subjected to expansion and contraction, to leaking flue gases, or steam or water. Some of it will be applied on fabric wrappings over thermal insulation. If these aspects are not studied, painting may prove to be an expensive item of plant maintenance.

Selling's the Word for '52

Those luscious days for electric appliance sellers when people shoved out their money and took what they could get are gone with the wind. Reports of retail buying at the January markets and showings in Chicago say this in no uncertain terms.

After quite a number of announcements early in winter of price increases by makers of television sets and appliances anticipating shortages and higher costs in 1952, the turn of the year saw announcements of price reductions. Now that the retailers by their orders at the January showings have reflected consumer ideas, one may expect price reductions to continue.

Of course, price has effect on buying. But it is far from being the only, or the most important, factor influencing the prospective buyer. People will pay a fair price for what they want. To make them want electric appliances and television sets in 1952 is a selling job that will have to be done all along the line from maker to distributor to retailer. That the makers appreciate the importance of this job is apparent from the numerous releases describing large advertising and other promotion plans now coming to the editorial desk. It remains to be seen how effectively the distributors and retailers do their part in making people want what they have to sell.

Now They Know

Uncomfortable lessons in the value of adequate wiring are being given to some thousands of American families. They are those who have moved into government housing projects erected in wartime. These facilities were intended to be torn down but were left standing and are being reoccupied by workers in defense plants.

Built when appliances were not obtainable and metals very scarce, the wiring and distribution lines in the projects were held to minimums. Now many of the people moving into them are finding that lights flicker and grow dim, refrigerators refrigerate only feebly, and radios and television sets don't operate at all.

During the war you could do without an electric refrigerator because you couldn't get one. Television was in the future; so you didn't miss it. But this is peacetime—officially. Automatic defrosting is fine when it is built into the refrigerator but not so good when low voltage causes it. And when your TV set refuses to show you Howdy Doodie and Uncle Milty at their appointed times, your suffering is acute. You realize then the value of adequate wiring.

THE ELECTRICAL WEEK

Featured in the News

Tories are no help to British Electricity Authority (p 74) . . . New York State Power Authority uses its annual report to take a cut at Interior and private power companies (p 75) . . . **More scholarships** are offered by Joint Industrial Board of electrical industry (p 76) . . . It may cost you more in fees to deal with the SEC (p 79) . . . **Military** and AEC will get additional metals country has produced (p 82).

• • •

Washington—NPA hopes to bring March copper allocations up to January levels. It had to cut back February allocations by 14,000 tons. No sizable increases in copper supply are seen for immediate future . . . Morehouse and Maybank power reports are still under study by DPA's power staff, which means DPA Administrator Fleischmann hasn't decided what to do about them yet . . . Interior Department is preparing another all-out bid for authorization of Hells Canyon project in Idaho . . . Senate Banking and Currency Committee is asking President Truman to reconsider his nomination of SEC Chairman Harry A. McDonald to be RFC administrator . . . FPC is attempting to determine whether five privately financed hydroelectric projects in Pacific Northwest are receiving any upstream benefits from government projects. Those being studied are: Rock Island, Metalline Falls, Cabinet Gorge, Thompson Falls, and Flathead . . . Eugene M. Zuckert of Connecticut is confirmed by the Senate as a member of AEC.

Securities and Exchange Commission expects to file a motion early this week to lift the temporary order of U. S. Ninth Circuit Court of Appeals which restrains it from holding hearings on the proposed sale of Washington Water Power to three Washington State PUD's. If these PUD's acquire WWP, they will "retire" Pres Kinsey Robinson and three vice presidents but will retain all other officials, Frank Stewart, public relations officer for Chelan County PUD reveals.

Pacific G&E renews an option on a site and is studying the possibility of building a steam plant in the vicinity of Eureka, on northwest coast of California. Present supply of the area's 41,000-kw load is from the Central Valley about 130 miles east, plus 17,000 kw of local steam. Severe storms interrupted transmission for several days last month, requiring a brownout in the area.

California-Pacific Utilities auxiliary plant at Prairie City, Ore., was destroyed by fire with loss estimated at $350,000. Cause is undetermined.

Happy Centennial will be celebrated by New York State E&G on Oct. 11. Celebration will run all summer with the climax set for that date.

Florida P&L wins 30-year franchise in Miami Beach by a vote of about 5-to-2.

For interesting booklet of reprints on labor's views on public ownership which appeared in the 1951 issue of the New York Federationist (New York State Federation of Labor), write More from Niagara, Niagara Falls, N. Y.

More Washington—Federal license has been granted Niagara Mohawk Power for its 90,000 kw project on Raquette River in St. Lawrence County, N. Y. . . . FPC has authorized Montana Power to import Canadian natural gas at the rate of 40 million cu ft per day for exclusive use of Anaconda Copper Mining Co. President Truman also has issued a permit for operation of the international pipeline to bring in the gas.

Florida Power Corp is denied State Railroad and PUC permission to increase its rates in Pinellas County or any of the other 30 counties which it serves because the commission does not have the power to order an increase in Pinellas County until the Supreme Court rules on a disputed order of the now-defunct Pinellas Utility Board cutting the rates there.

Commonwealth Edison system capacity passes 3 million kw mark for first time, reaching 3,062,000 kw when a 110,000-kw unit was placed in operation about 3 months ahead of schedule at Waukegan plant of Public Service of Northern Illinois.

Salary Stabilization Board will open its first field offices today in New York and Boston. Others will be opened in Philadelphia, Cleveland, and Detroit. Eventually, SSB will have offices in every city where there is a regional wage stabilization board. They will share office space with WSB, so you may use the WSB address for SSB. Offices will be staffed with analysts and attorneys. They will be empowered to decide applications for salary adjustments.

Central Arizona L&P and Arizona Edison will issue a joint annual report of their 1951 operations shortly. Report will be issued by Arizona Public Service Co, the merged name of the companies, after Mar. 1 . . . At meetings held Feb. 4, Carolina P&L stockholders voted 78% of all outstanding stock for merger with Tide Water Power with only 2/10ths of 1% against; Tide Water stockholders voted 72% for and only 35/100ths of 1% against. Carolina gets approval from FPC for the merger, which becomes effective Mar. 1.

Congratulations—Boston Edison elects Hugo W. H. Wellington vice president in charge of steam and electrical operations . . . Newell A. Clark becomes president of the following New England Electric System companies in Massachusetts: Lowell Electric Light, Haverhill Electric, and Amesbury Electric Light, and vice president of Lawrence G&E, succeeding Leon E. Seekins, who resigned because of ill health. Clark continues as president of system companies in the Mystic Valley and North Shore areas.

WASHINGTON COMMENT

JESSE MOCK

For some reason—possibly political—there is no great hurry to have the Supreme Court act on the Roanoke Rapids case before the November elections.

This is the case in which the Interior Department is contesting a federal license held by Virginia Electric & Power Co for constructing and operating a 91,000-kw hydroelectric project at Roanoke Rapids, N. C.

In a hotly worded decision last October, the U. S. Court of Appeals for the Fourth Circuit upheld the action of the Federal Power Commission in issuing the license.

The court went on to say that Interior was out of bounds in entering the case in the first place. Interior was found off base in each of its contentions, and the opinion added up to an embarrassing defeat for the department.

Could Interior Be Stalling? . . . For the past four months, a series of delays has put off appeals action. Interior contends that it has been carrying along the case as rapidly as possible, but each move seems to have been put off till the last minute.

It was a full month before Interior asked for a rehearing of the case by the Appeals Court. A week later, Nov. 5, the request was denied. The request did serve to extend the time for filing a Supreme Court appeal until Feb. 3.

Since early November Interior has been trying to obtain the consent of the Solicitor General to carry the case to the high court.

Finally, President Truman intervened on Interior's behalf. But even with this high-powered backing, the Justice Department acted only a few days before the deadline for filing a request for Supreme Court review.

This, said Interior, made it necessary to ask for a further extension of time in which to file a petition with the high court. The time has now been extended until April 1. Even after the petition for review is filed, there are more preliminaries before the Supreme Court can even decide whether it will take a look at the case.

All these delays, whether deliberate or not, will likely put off the actual Supreme Court arguments and decision until after this year's elections, if the court decides to hear it at all.

Chapman Gains by Delay . . . This would have some obvious advantages for Interior Secretary Oscar L. Chapman, the former Denver lawyer, who is really pushing the case. It would leave some doubt as to his role in the licensing of hydroelectric projects. He is already solidly on record as an advocate of federal construction of power projects wherever and whenever possible. It should be evident that he doesn't care to have the high court clip his wings on that score until after the November presidential election.

Put in more simple terms: The Truman Administration believes federal power projects are vote-getters. It would just as soon not give the Supreme Court a chance to limit these projects until after the vote is in.

There is still another point to be considered. Interior is giving much thought to taking the Kings River case to the courts. Since this case is, in some way similar to the Roanoke Rapids case, it may be preferable to get a lower court decision on King's River before getting a high court decision on Roanoke Rapids.

All three of the issues that Interior will bring to the Supreme Court in the Roanoke Rapids case have been dealt with directly by the appeals court. Interior will seek to establish that it is an "aggrieved party" and hence eligible to bring suit. Second, it will try to show that the Roanoke Rapids site has been withdrawn by Congress for federal development. Third, it will argue that FPC once approved the general Roanoke River Basin Plan and in doing so precluded issuance of licenses for any private development within the basin.

It appears the Supreme Court will have to side with Interior on the first of these issues and one of the other two in order to reverse the opinion of the appeals court.

TECHNICAL NOTES

ARCHER E. KNOWLTON

(Excerpts adapted from paper "The Objectives of Graduate Engineering Education—An Employer's View" by William Oncken, Jr, Director of Civilian Training, U. S. Navy Bureau of Ordnance, at recent AIEE Winter General Meeting.)

Engineer shortage may well be more critical than material shortages in holding back our defense effort. Fortunately, however, no other nation has raised a generation so much at home in things electrical and mechanical as we have.

Employers are in no way less responsible, morally and practically, for developing and husbanding the research talent of the nation than is the university.

Research requires insatiable curiosity balanced by systematic inquiry along with optimism, insight, and resourcefulness to carry through despite the "obviously impossible" obstacles in the path.

Design engineers should be able to demonstrate inventiveness and foresight toward gaining maximum utility at minimum expense.

Tape, twine, and baling wire are not beneath the dignity of the researcher or designer in field work even if abhorred in the laboratory.

Teamwork in science and engineering alike requires that the individual must be willing to temper his own purely professional interest in a problem with the technical objectives of his group.

Technical individuals should acquire the ability to express themselves to others, whether orally or in writing, in terms in which the others are at home, without becoming condescending or patronizing.

Good talkers are not necessarily good technical men but good technical men who make a poor impression as speakers may have to wait longer for deserved recognition.

Good experimenters should have a reasonable stock-in-trade of special techniques, artifices, gadgets, "trick circuits," and mechanisms to help short-circuit obstacles and difficulties.

December Peak Load Hits Record 67,850 Mw

A record peak load of 67,850 Mw is indicated for the nation's principal (Class I) electric utility systems during December. This was 1,903 Mw or 2.9% higher than the previous high 65,947 Mw reached in November. It was also 6,131 Mw or 9.9% higher than the peak of December 1950. In that year the increase from November to December was only 1,689 Mw or 2.8%.

Preliminary estimates of peak loads on Class I systems are prepared by the Edison Electric Institute.

Our apologies to . . .

Irving Trust Co for neglecting to credit it with the "Security Sales by Electric Light and Power Companies" tabulation shown on page 156 of the Jan. 28, Statistical Issue.

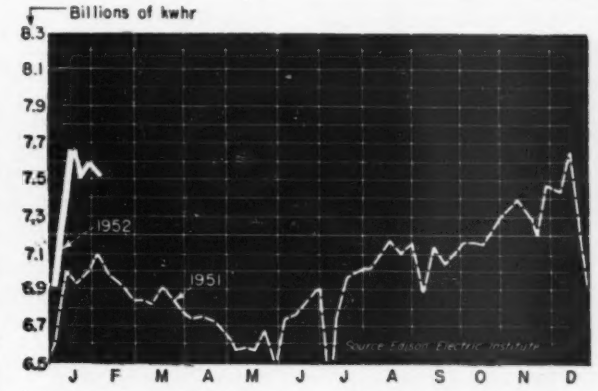
Our thanks to . . .

Edison Electric Institute, Federal Power Commission, International Brotherhood of Electrical Workers (AFL), Irving Trust Co, Moody's Investors Service, National Electrical Manufacturers Association, Rural Electrification Administration, U. S. Bureau of Labor, and Utility Workers Union of America (CIO) for their cooperation in providing us with the facts and figures used in the issue.

Class I electric utility systems are those systems which have a net energy requirement of 50 million kwhr or more annually.

Estimated peak load for December 1952, based on data reported as of Nov. 30, by the Class I utilities, is 77,701 Mw. That of December 1953, 84,725 Mw, and that of December 1954, 90,215 Mw.

Substantial increases in recent estimates of peak loads reflect the accelerated national preparedness program. This trend is evidenced by the fact that in the 12 months ended Nov. 30 the Class I systems peak load estimates for December 1952 increased 7.4%, those for December 1953 increased 10.3%.



Output Week Ended Feb. 2—7,572,432,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Feb. 2	+6.7	+3.4	+5.3	+5.1	+6.0	+ 9.8	+19.4	+ 4.5	+ 1.9	+ 6.3
an. 26	+9.3	+6.2	+6.7	+6.8	+9.9	+10.8	+19.2	+10.9	+11.3	+12.1
Jan. 19	+9.1	+6.1	+7.1	+6.5	+8.3	+10.1	+20.5	+10.2	+11.4	+12.0

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load—Class I Utilities (Million Kw)	Dec.	67.85*	65.95	60.03
Capacity (Million Kw)	Nov.	75.18	74.68	67.98
Production (Billion Kwhr)	Nov.	32.10	32.44	29.02
Hydro		8.08	7.55	7.67
Fuel		24.02	24.89	21.35
Sales (Billion Kwhr)	Nov.	27.92	27.68	25.39
Residential		7.37	6.85	6.41
Commercial		4.68	4.65	4.21
Industrial		13.89	14.13	13.00
Other		1.97	2.05	1.82
Fuel Consumption				
Coal (Million Tons)	Nov.	9.72	9.58	8.76
Oil (Million Barrels)		5.95	5.44	6.20
Gas (Billion Cu Ft)		53.70	72.00	47.76
Net Income Class A & B Utilities ($ Million)	Nov.	70.81	54.02	65.27
Dec. 52 Peak Class I Utilities (Million Kw)*	Nov.	77.7	77.4	69.9
Kwhr per Residential Customer (12 Month Average)	Nov.	1,988	1,972	1,813
Revenue per Kwhr Residential Service (12 Month Average)	Nov.	2.82¢	2.83¢	2.82¢
Canadian Production (Billion Kwhr)	Nov.	4.04	4.92	4.46

Business Statistics

FRB Industrial Production Index†††	Dec.	216*	219	216
Gross National Product Annual Rate ($ Billion)	4th Qtr.	333.0	327.6	303.7
EW 5 Industry Production Index	Dec.	125.0	124.4	120.3
ENR Construction Cost Index††	Jan.	114.8	114.8	111.3
BLS Consumer's Price Index	Dec.	189.1	188.6	178.8
NEMA Insulation Materials Sales Index†	Nov.	511	559	542
NEMA Electric Appliance Sales Index (Unadjusted)	Nov.	269	305	367
NEMA Household Refrig. Sales Index†	Nov.	87.7	113	228
Metal Prices				
Copper, Conn. V., lb		$ .24½	$ .24½	$ .24½
Lead, N. Y., lb		.19	.19	.17
Zinc, prime Western E. St. Louis, lb		.19½	.19½	.17½
Tin, Straits, qual. N. Y., lb		1.21½	1.03	1.82½
Aluminium, ingot, base price		.19	.19	.19
Nickel, base price		.56½	.56½	.50½
Steel, billets, Pitts., ton		56.00	56.00	56.00
Steel, scrap, No. 1 heavy, Pitts., ton		45.00	45.00	46.50

* Estimated † 1936 = 100 †† 1949 = 100 ††† 1937–39 = 100 (Unadjusted

BANKSIDE STATION in London is now being entirely rebuilt. When the two 60,000-kw units now being installed are operating, the old 79,000-kw plant will be demolished and two other 60,000-kw units added. Opposition to rebuilding the station was great because of its prominent location and dirt. So the government agreed to limit fuel to oil and as designed the station will be one of the most beautiful in the world. Picture shows the construction of the jetty where Thames River barges will deliver oil. Across the river is St. Paul's Cathedral

Tories No Help to BEA

Churchill government is stressing economy and frowns upon authority's efforts to increase British capacity

(*McGraw-Hill World News*)

Some months ago the Tories ousted the Labourites from control of the British government. But so far the British Electricity Authority, administrative agency for the nationalized electric utility industry, hasn't gained as the result. Actually it may even lose.

When the Labourites nationalized the industry in 1947, it was in poor shape as the result of the six years of war which halted all industrial progress not directly connected with the war effort. In the six years of peace that have followed the industry has made great progress. BEA, directed by Lord Citrine, has been progressing rapidly. The only thing that the Tories can do to outshine their political opponents is to speed the rate of progress.

Tories to Put on Brakes . . . But all indications to date are that the Tories are planning to put the brakes on BEA. Economy is now the watchword. Churchill has left no doubt that he intends to be ruthless in cutting government expenditures. Bankruptcy for Britain may hang in the balance. BEA's requirements will have to be scrutinized along with those of other government agencies.

Last fall the Labour government in one of its last acts told BEA that no more than 1.55 million kw of capacity should be installed in any one year. Lord Citrine complained that wasn't enough. He wants authority to plan a construction program of 1.8 million kw in 1956. He said, "If we can't go to that figure, I see no prospect of overtaking potential demand."

BEA Expansion May Be Cut . . . But the Tories aren't likely to be any more generous. In fact they have another approach which would cut down BEA's expansion plans. The approach is to generate power for industry in small plants erected at industrial plants needing power. Supporters of getting industry to supply more of its own power argue that site-generation should be two or three times as efficient as BEA's central stations.

The hitch, as Lord Citrine quickly pointed out, is where do you get the small generating equipment. Under the Labour government BEA was persuaded to order 100,000 kw of 1,000 hp plus diesel plants for industry. Delivery is taking as long as three years. And such plants are more costly to operate.

Like American manufacturers the British are having trouble getting materials. So far production of heavy power equipment has not been cut back. But that danger exists.

The new government is stressing fuel economy. BEA's plans for the next 10 to 15 years call for increasing coal consumption 30 million tons a year. This figure is frequently attacked as unreasonable in light of other demands such as export and the steel industry. BEA defends itself by saying the coal it uses is low grade and cannot be used efficiently by anybody else. But even low-grade coal is scarce in Britain despite the fact that the government has nationalized also the coal industry.

Higher Pressure For Boilers . . . BEA is now following American practice of going to higher pressures and temperatures for its boilers. This will improve fuel efficiency. About 75% of the stations scheduled for service after 1956 will use steam at 1,500 psi, 1,050 deg.

Despite its own gloomy predictions for 1951, BEA set a record by installing 28 turbogenerators with a capacity of 1,235,000 kw. Ten of these units went into new plants. The other 18 were added to old plants. Because it was impossible to install all the boilers needed, the actual increase in capacity was only 1,113,000 kw. Allowing for increased demand, this new capacity will probably lop off over 300,000 kw from Britain's power gap at peak load. A year ago this gap was estimated at 800,000 kw.

15.6 Million Kw on Line . . . Total capacity now tops 15.6 million kw with a capability of approximately 14 million kw. A combination of improved maintenance records, mild weather, and some 500,000 kw saved at peak load through industrial load-spreading has made power cuts unnecessary so far this year.

Interior Plans Criticized . . .

. . . by New York Power Authority: State agency wants to build St. Lawrence and Niagara projects rather than let federal government or private companies do it

New York State Power Authority sharply criticized Interior Department in its recent annual report for asking federal development of power from St. Lawrence River and Niagara Falls.

Interior plans for public development of these two projects was branded in the report as "part . . . of a trend toward unnecessary centralization of government."

Such development of the projects, the State Power Authority contended, would mean public construction of transmission lines even though private companies were willing to do the job and preferential sale of power to municipal and cooperative customers. It would hinder or block completely an integrated Northeast power pool, the authority said.

Interior Silent . . . In Washington last week Secretary of the Interior Oscar Chapman told Electrical World he had no comment on the New York report.

If New York is permitted to build the hydro projects, the authority said, cheap power would be produced, strong interconnections with present transmission and distribution systems in the Northeast would be made and there would be an "equitable sharing of power among all consumers, whether they are served privately, publicly, or cooperatively."

The state agency, which said it was set up 21 years ago to proceed "forthwith" to develop the power potential of the St. Lawrence River, called efforts to block it from developing the International Rapids section of the St. Lawrence near Massena "criminal." The authority applied to the Federal Power Commission for a license to build the project in association with Ontario but FPC denied the application and urged the seaway and power be developed as a federal project. The power authority has kept its application alive by an appeal to the Federal Circuit Court of Appeals.

Pigeonholed . . . The power authority report stated the U. S. side of the St. Lawrence could be developed for power by New York without Congressional consent if FPC and the International Joint Commission grant approval. Federal participation in the project has been delayed by the refusal of two Congressional committees to report out bills permitting the U. S. to join Canada in developing the river (EW, Feb. 4, p10).

In regard to the Niagara Falls project, the State Power Authority report noted that in 1950 Canada and the U. S. concluded a treaty permitting diversion of additional water from Niagara Falls for electric power. In ratifying the treaty, however, the U. S. Senate added a reservation that no use could be made of the additional water without Congressional authority.

Condemns Two Bills . . . During the past year three bills concerning Niagara power have been drawn up and discussed in committee. One would permit development by private companies; the second, federal development; and the third, development by New York State. The first two bills were condemned in authority report.

The State Power Authority also reported that during the year it had purchased the war surplus power transmission line from Massena to Taylorville, the first tangible property the authority has had in its custody. The 78-mile line is leased to Niagara-Mohawk Power Corp.

The Utilities Still Have Some Winter Ahead . . .

. . . as these pictures of recent headaches indicate. At the left, a pole was snapped off by an accumulation of ice from the spray of hoses during a fire in zero weather at Portland, Me.

Picture at right shows downed wires and broken poles blocking a highway between Charleston and Bertrand, Mo., following one of the worst ice storms to hit the area in recent years. (AP Wirephotos)

More Scholarships Offered . . .

. . by Joint Industry Board of the electrical industry. Daughters of workers now eligible for college training

A further broadening and extension of the largest industry-supported scholarship program in the history of Columbia University was announced by Harry Van Arsdale, Jr., business manager of Local No. 3 of the International Brotherhood of Electrical Workers, AFL.

The educational program, launched by the Joint Industry Board of the electrical industry in 1949, is believed to be the first ever instituted by a joint group of labor and management. Since its inception it has provided scholarships for as much as six years of study at Columbia University for sons of electrical workers of New York City. Winners of the scholarships were to complete three years of liberal arts studies at Columbia College, at the end of which time they could transfer to Columbia's School of Engineering for an additional two years of professional training.

Daughters Eligible . . . Under the broadened program, which becomes effective for the 1952-1953 academic year, daughters of electrical workers also will be eligible for four-year scholarships at Barnard College, followed by an additional two years at a school of medicine or dentistry.

The joint labor-management project has also been widened to provide that workers' sons not desiring to pursue the study of electrical engineering may substitute the study of medicine or dentistry at an approved school upon graduation from Columbia College.

Van Arsdale pointed out that the new provisions of the program have been designed to provide equal opportunities to all children of electrical workers.

Conferences Held . . . The increased benefits under the electrical scholarships resulted from a series of conferences by representatives of management and labor groups within the industry with Dr Millicent C. McIntosh, dean of Barnard College, Dr Lawrence H. Chamberlain, dean of Columbia College, and Dr John R. Dunning, dean of the School of Engineering.

In an appraisal of the program, Dean McIntosh declared:

"The action taken by the Joint Industry Board in opening their scholarships to daughters of their members will be welcomed enthusiastically by educational institutions. The basic American concept of equal opportunity for all is well illustrated by this move. Even more important is its demonstration of the belief that men and women share equally the responsibility to develop their potentialities to the full and to contribute the maximum to their families and to society."

Dean Chamberlain pointed out that the project, in its entirety, represents a minimum endowment of $1 million to Columbia. He explained that an endowed fund of nearly $15,000 would be necessary to support one of these scholarships on an annual basis. At the end of three more years the scholarships will be supporting 78 students at the University, he added. Eight students are now enrolled in Columbia College.

Tom Gets a Raise

Tom Kilowatt, one of Georgia Power Co's "most trusted and loyal employees" has been granted an increase in compensation by the Wage Stabilization Board.

The company recently petitioned the board for a merit increase, consisting of one quart of milk weekly and a 25% hike in meat rations, for the tom cat. (Federal wage legislation does not positively define employees as people.)

In granting the raise, WSB said: "It would be in order under the cat equities of CWR 33 to permit extra compensation."

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Higher Production Tied to Farm Electrification

Farm electrification is one of the greatest and best potentials for increasing farm production, Claude E. Wickard, Rural Electrification Administrator, recently told a session of the Farm Production Power Use Conference in St. Louis.

The conference was attended by about 225 representatives of REA-financed cooperatives from all parts of the country.

Wickard pointed out that farm production goals announced by the Agriculture Department for 1952 were nearly 50% higher than average production in the years just before World War II but that there were fewer agricultural workers today than there have been for several decades.

He said rural electric co-ops were in a position to help farmers overcome the manpower shortage and boost production efficiency and output by putting electricity to the greatest possible use on every farm.

The REA administrator said 84% of the nation's farms were electrified. "The more electricity these farmers use, the less it costs them per kwhr," he added.

The importance of farm efficiency was stressed by Secretary of Agriculture Charles F. Brannan in a paper read at the conference. Declaring that the American farmer is the real foundation for hope of a lasting peace, Brannan said the scarcity of food was the world's greatest economic problem. He said "American know-how and production—and the sharing of them—are the bases of our economic effort to bring peace and hope to the world."

10,000th Con Ed Donor

Consolidated Edison Co of New York's blood program, believed to be the oldest in American industry by Red Cross officials, received its 10,000 donation recently.

Budget Hearings . . .

. . . draw spokesmen (critical and otherwise) from Interior, power companies and cooperatives

Power companies and cooperatives got their first chance last week to say what they liked and what they didn't like about President Truman's budget for fiscal 1953.

Opportunity was afforded them by the house appropriations subcommittee on Interior Department funds. Interior had already put in its arguments in favor.

First witness for the companies was Harllee Branch, president of Georgia Power Co, who opposed construction funds sought by Southeastern Power Administration for transmission lines. A number of other southeastern companies also were scheduled to protest Sepa requests for about $6 million.

From other parts of the country power company representatives came to present their views. A rural electric cooperative group and Northern States Power Co were expected to support a proposal to build a federal transmission line from the Missouri basin to points in Minnesota.

Branch called the proposal to construct federal transmission lines from the Clark Hill project in Georgia "totally unnecessary."

Main argument between Interior and Georgia Power seemed to be over whose customers the preference agencies would be. The power company insisted it should retain the customers and deliver the power. But Interior argued that the company should be merely the delivery agent.

The committee hoped to complete hearings by mid-February and get to work writing the funds bill.

So, Back to Hooper

Martin Block, popular New York disc jockey, told his listeners to turn out all their lights at 7:15 one night recently. Said he was going to call Consolidated Edison and ask how much its load dropped, and that way, figure out his own "Hooperating." At the time, Con Ed was putting out 2,300,000 kw: a spokesman there reported nary a dip.

How Much Should They Cost?

Paul L. Monahan, House Armed Services Committee investigator, displays two identical 25 watt lamps. He said Army Medical Service paid 13¢ for one, Signal Corps 37¢ for the other. Carl Vinson, Georgia Democrat who heads the committee, said military leaders will be asked to explain why the Army, Navy, and Air Force often pay different prices for the same commonly used items, such as light bulbs.

Reclamation Engineers to Aid India Program

Six Bureau of Reclamation engineers will leave for India within the next two months to assist that country with its land reclamation and hydroelectric development programs.

At India's request, the engineers will advise the Central Water and Power Board on problems relating to dam and powerhouse design and construction. This technical assistance is one phase of the recently announced expanded Point Four cooperation with India. During the current fiscal year, expenses of these engineer advisors will be financed by the special Indo-American technical cooperation fund set up under the joint agreement.

First of the group to leave is Clarence Rawhouser of Denver who will serve as consultant on dam design and will organize and direct the technical work of a dam design division in India's Central Water and Power Board. Rawhouser has been on the bureau's Denver engineering staff since 1930.

Others in the group include Paul von der Lippe, also of Denver, who is a specialist in canal, dam, and powerplant structural design and Clifford L. Mutch of Arapahoe, Neb., construction engineer. An electrical engineer, a concrete control engineer, and a mechanical engineer will complete the party.

Interior to Ask Review of Roanoke Rapids Case

Interior Department will ask the U. S. Supreme court to review the Roanoke Rapids case, but has not yet formally done so (See Washington Comment, p72).

An extension of time until April 1 has been granted in which the petition for review can be filed. An Interior spokesman hinted last week it would take some time to draw up the petition and agree on the case documents to be submitted to the high court.

Opposing the department in filing the petition will be Federal Power Commission and Virginia Electric & Power Co.

Vepco recently broke ground near Roanoke Rapids, N. C. for a 91,000-kw dam, the center of the dispute.

HENRY B. TALIAFERRO

HARVEY F. McPHAIL

Promoted by Reclamation Bureau

Harvey F. McPhail has been named an assistant commissioner and Henry B. Taliaferro, acting director of the Power Utilization Branch of the U. S. Bureau of Reclamation.

McPhail moved up from the Utilization branch post with the transfer of Wesley R. Nelson to the State Department to accept an assignment with Technical Cooperation Administration in the Far East. Taliaferro stepped into McPhail's former post from his job as regional power manager for Reclamation's Central Valley project.

Power Blackout Seen Next Winter in Alaska

William C. Wise, assistant REA administrator, predicts that a "stringent blackout" will be necessary in the Anchorage, Alaska, area next winter and that the area will run out of power by 1956-57. The blackout, he said, can be avoided only if priorities are secured which permit completion of a steam plant by next November.

The Chugach Electric Association and the Inlet Power & Light Co have requested their customers, living outside the Anchorage city limits, to curtail their power use daily between 5 and 8 p.m. The Matanuska Electric Association at Palmer, as well as Elmendorf Air Force Base and Fort Richardson, also are seeking to conserve power.

Wise suggested that Alaskans take action to induce Congress to appropriate funds for a Susitna Basin hydroelectric project proposed by the Bureau of Reclamation.

Contractors Quit Group

A number of electrical contractors have quit the Milwaukee Association of Commerce because of the association's firm support of a move to liberalize the city's electrical code. Revision of the code, which would have permitted use of less expensive nonmetallic sheathed cable and service cable, was rejected recently by Milwaukee's common council.

Utilities Asked to List Treated-Pole Needs

Substitution of wooden poles for steel towers by electric utilities is bringing its problems. For one thing, increased use of poles calls for expansion of the facilities to pressure-treat the poles.

To get an idea of how much expansion is needed, Defense Electric Power Administration recently requested utilities to supply estimated use of treated forest products during 1952.

This information is to be submitted on Form DEPA 16, which must be returned by Feb. 13. Information supplied on this form will be turned over to National Production Authority for use in expediting expansion of the pressure-treatment industry.

Forest products are not controlled materials and there is no plan at present to bring them into this category. If allocation of these products are undertaken, Depa said its Form 16 will not be used as the basis for allocation for any individual utility.

Since electric utilities are the largest user of treated poles, it is important that the 1952 estimates be as realistic as possible. Otherwise, the information might result in over or under-expansion of the pressure-treatment industry.

Here's How to Get in the Scrap for Defense

1. Go after Dormant Scrap—Start an emergency inspection and inventory of all heavy steel, whether machines, equipment, beams, or plates. Dispose of everything you possibly can to a scrap dealer.

2. Delegate Authority—The top executive of every industrial and commercial establishment, large and small, should appoint someone with authority to act in cleaning out dormant scrap.

3. Appoint a Salvage Committee—In large industrial firms the chief executive should insure complete coverage by appointing a salvage committee with authority to determine what is scrap and to order its disposal. The committee should:

- **(a) Search all plants and properties, regardless of size, for dormant scrap.**
- **(b) Survey potential wrecking and dismantling projects that will produce scrap.**
- **(c) Make disposition of all production and dormant scrap as quickly as possible.**

4. Put Scrap Collection on a "Housekeeping Basis"—Make it the personal responsibility of the committee chairman to initiate a program to clean out the dormant scrap and to make a scrap survey every 30 days. Besides increasing the supply of scrap, continuous scrap recovery from questionable old stand-bys, obsolete machines and equipment reduces taxes through inventory write-off, improves safety conditions, gives lowered insurance rates, and clears valuable space.

—Where There is Business, There is Scrap—

FINANCIAL

SEC Plans to Extend Fees

Proposed schedule of service charges is drawn up. Commission will hear opinions on changes until Feb. 20

Parties doing business with Securities and Exchange Commission can expect to foot more of the expense from now on.

To bring its service charges in line with Congressional policy, the commission last week rolled out a proposed schedule of fees for its various activities. Interested persons have until Feb. 20 to present their views on the proposed schedule. Then the commission will put out its final version.

Fees and Charges . . . Under the proposed version, the following fees and charges would be imposed:

1. Letters of notification and other exemptive filings under section 2(b) of the Securities Act—$25 per offering.

2. Qualification of trust indentures covering securities required to be registered under the Securities Act—$100 per indenture.

3. Annual registration fee payable by investment companies—ranging from a minimum of $30 for companies having gross assests of $300,000 or less to a maximum of $2,500 for companies having gross assets in excess of $200 million.

4. Annual registration fee payable by brokers and dealers—$50 plus $10 for each officer, partner and employee engaged in selling securities or supervising such activity.

5. Annual registration fee payable by investment advisers—$50.

6. Annual registration fee payable by public utility holding companies 1/200th of 1% of the assets of the system with a maximum of $25,000 and a minimum of $500.

7. Annual fee for certain conditionally exempt public utility holding companies—1/200th of 1% of the system assets with a maximum of $500.

Also, fees are nearly doubled for photocopies of SEC documents and for certification of such documents.

Charges Continued . . . These fees would represent a change of policy by SEC. Charges now in effect would be continued. These include registration fee for new security offerings registered under the Securities Act; the annual registration fee for national securities exchanges; and the filing fee for trust indentures qualified under the Trust Indenture Act relating to securities not required to be registered under the Securities Act.

The step is being undertaken as a means of fulfilling the Congressional directive carried in an appropriations act passed last year. Purpose is to make government services as self-sustaining as possible.

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Dayton P&L Will Spend $38 Million on Expansion

A $38-million expansion program for 1952-1953 was announced by Dayton Power & Light Co in one of the first 1951 annual reports coming to the Electrical World. This expenditure, added to the $96 million already invested, will bring the company's postwar total to $134 million.

Kenneth C. Long, president of the company, in his message addressed to both stockholders and employees said that the large increase in the company's facilities indicates "our confidence in the continued prosperity of this area and our ability to care for all customers' needs whenever and wherever required."

With a generating capacity of 460,000 kw in 1951 and a peak demand of only 359,000 kw, the company was in a position to make a very large contribution to a power pool created by other private electric utilities to assist the Tennessee Valley Authority in providing power for defense plants.

Features in the report include: (1) Theme "A Year of Balanced Progress;" (2) map "Economic Assets of Our Territory;" (3) tables showing results of company operations, balance sheet, and surplus for a five-year period and electric, gas, and other statistics for a ten-year period; and (4) chart showing not only the annual wage expense of the company but also the additional benefits in dollars received by its employees in 1951.

Heads PUC

Harold King Davison has been named chairman of the Public Utilities Commission of New Hampshire, succeeding Edgar H. Hunter, who continues as a member of the commission.

REGULATION

New York State Electric & Gas Corp has received Public Service Commission approval to increase electric rates $2.5 million annually . . . **Montana-Dakota Utilities** has received approval from Montana PSC to increase electric rates $148,970 yearly . . . **Niagara Mohawk Power Corp's** proposal to discontinue the existing low rate off-peak electric service to large industrial consumers in its eastern and central divisions has been suspended pending determination whether the plan is justified, New York Public Service Commission announced. The proposal would result in an increase of more than $600,000 annually in the rates of industries using large quantities of power.

FINANCIAL BRIEFS

Wisconsin Electric Power Co has bought the Greendale public housing administration distribution system for $50,000 . . . **Interstate Power Co** has asked SEC approval to borrow **$4.3** million on 3¾% notes through **Dec.** 15, 1952 from two banks . . . **Tallahassee, Fla.,** is planning to **install** fourth unit of 7,500-kw to cost $1.4 million at its generating plant.

FINANCIAL continued

YIELDS (%) Operating Electric Utility Securities

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1952									
Jan. 31	2.92	2.96	3.13	4.21	4.33	4.76	5.35	5.90	6.50
Jan. 24	2.95	3.00	3.15	4.24	4.35	4.79	5.34	5.90	6.53
END OF QTR:									
4th 1951	3.02	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84
3rd 1951	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05
2nd 1951	3.02	3.11	3.23	4.11	3.37	4.68	5.73	6.38	7.78
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13

Data: Reis & Chandler, Inc.

Electric Utility Earnings

(Preliminary)

Company	Period Months	Period Ended	Net Income 1951	Net Income 1950	Earnings per Common Share 1951	Earnings per Common Share 1950
American Gas & Electric	12	Dec.	$24,637,194	$24,191,232	$4.55b	$4.86
Atlantic City Electric	12	Dec.	2,496,196	2,266,855	1.65a	1.52a
Boston Edison	12	Dec.	7,791,597	7,726,852	3.16	3.13
California Oregon Power	12	Dec.	2,338,100	2,111,513	1.83	....
Consolidated Edison Co. of N. Y.	12	Dec.	39,211,827	39,206,625	2.26a	2.44a
Dallas Power & Light	12	Dec.	3,315,365	3,224,792	....	....
Florida Power & Light	12	Dec.	6,706,731	6,304,554	2.80	2.43
Kansas City Power & Light	12	Dec.	4,299,148	4,676,266	....	....
Long Island Lighting	12	Dec.	4,971,137	3,745,468	1.17a	1.19a
Louisville (Ky.) Gas & Electric	12	Dec.	5,164,205	4,951,910	3.14	3.01
Middle South Utilities and subs	12	Dec.	10,942,965	10,602,570	1.81a	1.89a
Texas Electric Service	12	Dec.	6,528,068	5,444,444	....	....
Texas Power & Light	12	Dec.	6,104,456	5,771,483	....	....

a—On shares outstanding at end of each period; b—On average number of shares outstanding during year

Electric Utility Financing

Company and Description	Amount of Offering ($000)	Offering Price	Yield to Public
WEEK OF JANUARY 31—FEBRUARY 6			
Bonds			
Pennsylvania Power—1st mtg 3¼% 1982	$6,000	101.34%	3.18%
Louisville Gas & Electric—1st mtg 3⅛% 1982	12,000	101.467	3.05
Common Stock			
Kansas City Power & Light—317,792 sh (being offered to holders on 1-for-6 basis, record Jan. 22 to expire Feb. 6)	$8,421	$26.50	6.04%
WEEK OF FEBRUARY 7-13			
Preferred Stock			
Pacific Gas & Electric—163,986 sh $25 par 5% 1st Series A (being offered to employees at 24½ of which 23⅛ is being paid through payroll deductions, to expire Feb. 8; no underwriting)	$4,099	$24.50	5.10%
SCHEDULED FEBRUARY—MARCH—APRIL			Bid Date
Bonds			
Central Illinois Electric & Gas—1st mtg 1982	$4,000	.....	Feb. 26
Central Power & Light—1st mtg	10,000	.....	Mar. 4
Metropolitan Edison—1st mtg 1982	7,800	.....	Mar. 11
Interstate Power—1st mtg 1982	2,000	.....	Mar. 18
West Penn Power—1st mtg	12,000	.....	Apr. 1
Oklahoma Gas & Electric—1st mtg 1982	12,000	.....	.....
Los Angeles, Calif.—electric revenues	17,000	.....	.....
Narragansett Electric—1st mtg 1982	7,500	.....	.....
Tacoma, Wash.—electric revenues	35,000	.....	.....
Dallas Power & Light—1st mtg	6,000	.....	.....
Preferred Stock			
Delaware Power & Light—50,000 sh $100 par	$5,000	.....	Feb. 26
Metropolitan Edison—40,000 sh $100 par	4,000	.....	Mar. 11
Common Stock			
Southwestern Public Service—251,540 sh (being offered to com-holders on 1-for-13 basis, record Jan. 30 to expire Feb. 14; stockholders allowed over-subscriptions)	$4,402	$17.50	6.40%
Dayton Power & Light—256,007 sh (being offered to common holders on 1-for-9 basis, record Jan. 28 to expire Feb. 15)	8,192	32.00	6.25
West Penn Electric—440,000 sh (being offered to common holders on 1-for-8 basis, record Jan. 31 to expire Feb. 18; company named price and Lehman Brothers group won the unscribed shares with an underwriting compensation of 23 4995¢ a share)	12,650	28.75	6.96
Central Illinois Electric & Gas—64,000 sh (being offered to common holders on 1-for-10 basis, record Feb. 6 to expire Feb. 21)	1,280	20.00	6.50
Maine Public Service—35,000 sh (being offered to common holders on 1-for-5 basis, record Feb. 4 to expire Feb. 25)	534	15.25	7.87
Interstate Power—350,000 sh	.....	.....	Mar. 18
Texas Utilities—400,000 sh	.....	.....	.....

DPA Postpones . . .

. . . adoption of regulation affecting issuance of certificates of necessity

Defense Production Administration has temporarily postponed adoption of a new regulation affecting issuance of certificates of necessity for accelerated tax amortization.

Meanwhile, DPA last week announced it had granted an additional 21 certificates to electric utilities for proposed expansion projects.

The proposed regulation, which was to have gone into effect Jan. 1, would require companies desiring a certificate on a project costing $100,000 or more to obtain either the certificate or a letter of predetermination before beginning construction. Two weeks formal notice will be given before the proposed regulation becomes effective.

Construction Defined . . . In a draft of the proposed regulation, which is subject to change, "construction" was defined "the incorporation in place on the site . . . of physical materials as an integral and permanent part of any building, structure or other real property." Example given was the pouring or placing of footings or other foundations.

The draft then went on to explain what a utility might do prior to beginning "construction": "acquisition of land; engineering; contracting for construction; preparation of site; building of access roads; excavation; demolition; installation of service utilities required for construction; the fabrication, production or processing of building materials or building equipment; or the acquisition of personal property to be installed in the building, structure, or other real property does not constitute beginning of construction, reconstruction, erection or installation."

Forms sent out . . . To aid utilities desiring certificates of necessity, Defense Electric Power last week sent out forms, Depa-19, to all Class I utilities. Information gained from return of these forms will aid Depa in advising utilities on regulations and in advising DPA on priority to be given Class I utilities.

BEN W. CREIM

Ben W. Creim Dies; Sepa Administrator

Ben W. Creim, 54, head of Interior Department's Southeastern Power Administration, died Feb. 4 at an Elberton, Ga., hospital following an operation for internal cancer.

Creim, charged with marketing power from federal hydroelectric projects in the Southeast, was first operated on for cancer in early 1951. He had recovered sufficiently to resume his duties in the latter part of the year. He returned to the hospital for a second operation about two weeks before his death.

Since becoming Sepa administrator in March 1950, Creim had been organizing the agency and preparing for the marketing of power from the federal projects. He was seeking $6 million for construction of transmission facilities during fiscal 1953.

Long identified with federal power programs, Creim began his government career as a regional engineer for the Rural Electrification Administration, organizing its engineering activities in 19 western states.

He later served with Bonneville Power Administration as assistant chief engineer in charge of construction and operation. For four years prior to joining Sepa, Creim was power manager of Bureau of Reclamation's Region II at Sacramento.

A veteran of both World Wars, he attained the rank of Captain in the Navy during World War II. A Commander in the Navy reserve, he was buried at Arlington national cemetery.

Charles W. Leavy, chief counsel of Sepa, is acting administrator pending appointment of Creim's successor.

NPA Cuts Copper Use for Lighting Fixtures

National Production Authority is clamping down on the use of copper for lighting fixtures.

An order to become effective Feb. 15 restricts use of copper in fixtures to the following specified parts:

1. Exterior lighting fixtures (other than residential) and explosion-proof, dust-type, or vapor-type lighting fixtures: Current-carrying parts and wiring, plating, rivets, eyelets, screws, small fasteners, threaded parts, clamping, sealing, and attachment devices.

2. Residential and other fixtures: Current-carrying parts and wiring, plating, rivets, eyelets, screws, and small fasteners. Copper tubing is allowed for residential fixtures alone.

It is estimated the order will save nearly 4 million lb of copper a quarter. Similar restrictions were in effect during April-July 1951.

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Kennecott Boosts Wages

Kennecott Copper Corp and International Brotherhood of Electrical Workers, International Association of Machinists, Brotherhood of Locomotive Firemen & Enginemen, International Union of Mine, Mill and Smelter Workers, and Operating Engineers have agreed on cost-of-living pay increase for 3,600 workers at the company's Utah copper division. The boost amounts to 33¢ per eight-hour shift, or about 4¼¢ per hour, and is subject to approval of the Wage Stabilization Board. It is retroactive to Jan. 1, 1952.

CALENDAR

Edison Electric Institute
Electrical Equipment Committee, Netherland Plaza Hotel, Cincinnati, Ohio, February 11-12; Transmission-Distribution Committee, New Hotel Jefferson, St. Louis, February 14-15; 18th Annual Sales Conference, Edgewater Beach Hotel, Chicago, March 31-April 3; Purchasing Stores Committee, Roosevelt Hotel, New Orleans, La., May 11-14.

Public Utilities Advertising Association
Region 1 Meeting, Parker House, Boston, Mass., February 13-14; Annual Convention, Hotel Radisson, Minneapolis, Minn., May 8-9.

★**Pennsylvania Electric Association**
Systems Operation Committee, Benjamin Franklin Hotel, Philadelphia, February 14-15; Winter Meeting, Relay Committee, Fort Stanwix Hotel, Johnstown, Pa., February 20-21; Prime Movers-Electrical Equipment Committee, Benjamin Franklin Hotel, Philadelphia, February 28-29; Electrical Equipment Committee, Hotel Roosevelt, Pittsburgh, Pa., May 15-16.

★**American Institute of Electrical Engineers**
Induction-Dielectric Heating Conference, Carter Hotel, Cleveland, Ohio, Feb. 19-20; Southwest District Meeting, Jefferson Hotel, St. Louis, Mo., April 15-17; Welding Conference, Rackham Memorial Bldg., Detroit, Mich., April 16-18; arranged jointly by American Welding Society, Detroit Section and Industrial Electrical Engineers Society, Detroit; Northeast District Meeting, Arlington Hotel, Binghamton, N. Y., April 30-May 2; Summer General Meeting, Hotel Nicollet, Minneapolis, Minn., June 23-27.

Public Information Program
East North Central Region Meeting, Fort Wayne Hotel, Columbus, Ohio, February 21.

North Central Electrical Industries
Annual Convention-Trade Show, Hotel St. Paul, St. Paul, Minn., February 24-28.

American Society for Testing Materials
Spring Meeting-Committee Week, Hotel Statler, Cleveland, Ohio, March 3-7; Annual Meeting, Hotels Statler-New Yorker, New York, June 23-27.

National Electrical Manufacturers Association
Section Meeting, Edgewater Beach Hotel, Chicago, March 10-13; 4th International Lighting Exposition - Conference, Industrial - Commercial Lighting Equipment Section, Cleveland Auditorium, Cleveland, May 6-9.

National Rural Electric Cooperative Association
Annual Meeting, Conrad Hilton Hotel (formerly Stevens Hotel), Chicago, March 10-13.

National Association of Corrosion Engineers
Annual Conference, Buccaneer Hotel, Galveston, Tex., March 10-14.

Southeastern Electric Exchange
Engineering-Operation Section Conference, Jung Hotel, New Orleans, La., March 13-14; Annual Conference, Boca Raton Hotel, Boca Raton, Fla., April 21-23.

Illuminating Engineering Society
South Pacific Coast Regional Conference, Hotel Sir Francis Drake, San Francisco, March 13-14; Southwestern Regional Conference, Hotel Tulsa, Tulsa, Okla., April 6-8; Southern Regional Conference, Hermitage Hotel, Nashville, Tenn., April 20-22; Canadian National Conference, Hotel General Brock, Niagara Falls, Ontario, Can., April 30-May 2; Great Lakes Regional Conference, Hotel Statler, Cleveland, Ohio, May 5-6; East Central Regional Conference, Webster Hall Hotel, Pittsburgh, Pa., May 22-23; Northeastern Regional Conference, Hotel Preston, Swampscott, Mass., June 19-20.

Pacific Coast Electrical Association
Operating Economics Section Conference, Hotel California, Fresno, Calif., March 20-21; Administrative Services Section Conference, Los Angeles, April 17-18; Business Development Section Conference, Hotel Huntington, Pasadena, Calif., April 24-25.

A&M College of Texas
Annual Conference for Protective Relay Engineers, Department of Electrical Engineering, College Station, Tex., March 24-26.

American Society of Mechanical Engineers
Spring Meeting, University of Washington, Seattle, March 24-26; Semi-annual Meeting, Sheraton-Gibson Hotel, Cincinnati, Ohio, June 15-19.

American Power Conference
(Formerly Midwest Power Conference)
Sherman Hotel, Chicago, March 26-28.

Oklahoma Utilities Association
Annual Convention, Biltmore Hotel, Oklahoma City, March 27-28.

Tennessee Valley Public Power Association
Annual Meeting, Peabody Hotel, Memphis, Tenn., March 31-April 1.

Missouri Valley Electric Association
Engineering Conference, Hotel President, Kansas City, Mo., April 2-4.

Maryland Utilities Association
Lord Baltimore Hotel, Baltimore, April 4.

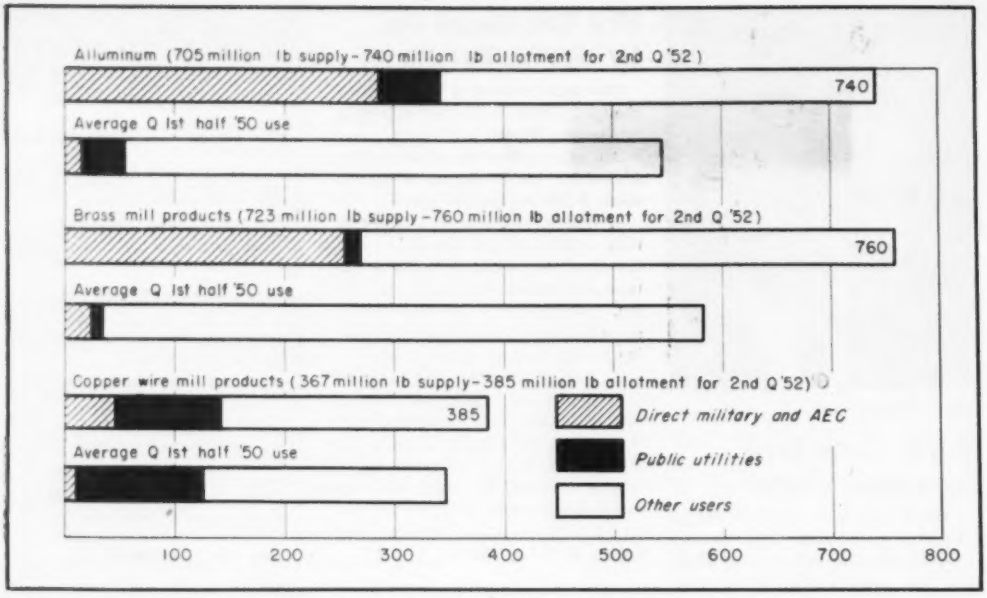
Rocky Mountain Electrical League
Spring Conference, Shirley Savoy Hotel, Denver, Colo., April 20-22.

American Public Power Association
Spring Convention, Hotel Olympic, Seattle, April 29-May 1. Joint Meeting with Northwestern Public Power Association, April 28.

★**C.I.G.R.E. Conference**
(International Conference on Large Electric High-Tension Systems) 14th Biennial Session, Paris, France, May 28-June 7.

International Organization of Standardization
Triennial Meeting, Columbia University, New York, June 9-21.

★ Addition this week.


Aluminum (705 million lb supply - 740 million lb allotment for 2nd Q '52)
740
Average Q 1st half '50 use
Brass mill products (723 million lb supply - 760 million lb allotment for 2nd Q '52)
760
Average Q 1st half '50 use
Copper wire mill products (367 million lb supply - 385 million lb allotment for 2nd Q '52)
385
Average Q 1st half '50 use
Direct military and AEC
Public utilities
Other users
100
200
300
400
500
600
700
800

Military and AEC Get the Additional Metals

The supply of aluminum, brass mill products, and copper wire mill products has jumped sharply since pre-Korea days. But increased demands by the military and the Atomic Energy Commission have taken all the additional production and more. Public utilities have also been given more aluminum and brass but less copper. Defense Production Administration has allotted more metals than it has. It believes 5% of allotments will never be used.

Reclamation Conducting Tests on Snake River

Bureau of Reclamation engineers are testing rock strata at sites on the Snake River in Idaho about six to ten miles downstream from American Falls Dam. Purpose is to determine feasibility of constructing a power dam in the area.

The bureau will report its findings in a project planning study which will cover the engineering and economic feasibility of developing the Michaud Flats Bench. If the results of present tests are favorable the bureau contemplates a power project for pumping water from the river for irrigation of 10,000 acres on the flats and producing additional electric power.

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PUD Workers Get Hike

Some 550 PUD employees in five Washington counties have been granted wage increases averaging 8%, effective Jan. 1, 1952, in contracts negotiated between the PUD commissions and the Electrical Workers' Union, A. F. of L. The new pay scales were established in Cowlitz, Snohomish, Lewis, Grays Harbor, and Franklin Counties.

•

PUD Considers Using Private Funds for Line

Rather than wait for a Rural Electrification Administration allocation, the Clallam County PUD of Port Angeles, Wash., is considering the use of private capital to construct a $650,000 transmission line from Port Angeles to Forks, according to Carl Miller, manager.

Construction could begin earlier if revenue bonds were sold to private capital, Miller said, although interest rates would be slightly higher. The PUD earlier received REA funds to construct a hydroelectric project on the Hoh River, but has abandoned this project and has been waiting formal approval from the REA to use Hoh River allocation for the transmission line.

Lose a Tribal Campsite? Not by a Damsite!

Seeking equivalent privileges for those destroyed when McNary and The Dalles dams are built on the Columbia River, Indian tribes of the Walla Walla, Wash., area have drafted a resolution seeking a "fair portion of the revenue from electric power to be sold from McNary Dam."

The tribes also want a tract on the shore of McNary Dam Lake to be used as a tribal campsite, the right to fish in the white water immediately below the dam and a campsite near the white water.

Jim Kanine, one of the last chiefs of the Walla Walla tribe, said his father signed a treaty in 1855 and heard Gov Isaac Stevens state "the Indians were giving up only land—the rivers would belong to them."

INDUSTRIAL CONTROL session speakers and chairman; (standing) E. E. Moyer, Rensselaer Polytechnic Institute; E. H. Vedder, Westinghouse Electric Corporation; W. S. Kupfer, Jr., Rensselaer Polytechnic Institute; W. R. Harris, Westinghouse Electric Corporation; (seated) O. W. Livingston, General Electric Company and J. A. Cortelli, Clarke Controller Company who was the chairman of the session

Equipment Designs and Materials Command Interest at AIEE Meeting

Prime features of discussion were clarification of generator short-circuit ratio and its effect on capability, a reopening of arguments on the relative merits of field experience and accelerated aging tests of conductor insulation, and proposals for revamping the rating of circuit breakers. Other items evoking active discussion were use of aluminum in and general standardization of substation structures and, again, the need for more system data on which to base carrier current designs.

Effects of oil on transformer insulation and the economy of transformer losses came up in another session. In still another there appeared a disposition to temper the prescriptions for impulse tests on transformers.

New data to enhance the efficacy of sleet melting on high lines and the benefits of using higher distribution voltages were launched at still other sessions. Reports on the diagnosis of outages on transmission and distribution systems gave welcomed data for guidance in designing lines for optimum balance of cost and performance.

POWER GENERATION

Selection of Characteristics for Turbine-Generator Motor-driven Exciters. H. G. Frus, *Duquesne Light Co.*; F. N. McClure and W. H. Ferguson, both *Westinghouse Electric Corp*

Merits of m-g exciters versus shaft-driven. Flywheel characteristics applied at Elrama station. Computation to achieve equality with direct-driven units as to reliability.

Experience with Automatic Voltage Regulation on a 115-Mw Turbogenerator. H. A. Cornelius and W. F. Cawson, both *Public Service Co of Northern Illinois*, and H. W. Cory, *Allis-Chalmers Mfg Co*

Static network rotating amplifier, automatic voltage regulation with minimum excitation feature corrects instability proneness of machine designed for low short circuit ratio (0.66) and high power factor (95%).

Search for a simplifying technique that will bring short circuit ratio and its consequences out of obscurity is not being too successful. Stability index was proposed in a conference paper by R. F. Lawrence and A. A. Johnson, of Westinghouse. They translated pull-out power at turbine capability into kva times short circuit ratio and thus derived the proposed index. Not too much support was manifested for it, but the divergent discussion contributed some clarification.

General Electric, said J. B. McClure, uses an effective SCR. One

advantage of this is that it comes out the same for ½, 15, and 30-psi hydrogen operation whereas the (defined) actual SCR varies from 0.8 to 0.695 to 0.64 for the differing capabilities. Cawson was disturbed because stability index appears to apply only for unity P.F. and infinite bus and F. L. Lawton, Aluminum Labs Ltd, because it does not seem suitable for hydro or diesel units. On the other hand, Public Service Electric & Gas said F. W. Gay, specifies pull-out power directly. With them, economic criterion as to the regulation and stability hinges on comparison of the reactor needed to achieve the extra excitation versus the cost of switching capacitors to get equivalent results.

Duquesne Light has shaft-driven exciters for the last 6 units (three at 1,800 and three at 3,600-rpm). Operating performance has been excellent, but there have been maintenance inconveniences and the inference was that this is why (Elrama) station has motor-driven exciters. Their adoption affords the chance for adequately rated spares (for later increase in unit size). Cornelius assured R. J. Purdy, of Commonwealth Edison, that the regulator circuit has control elements for power factor range. In fact, he said the operators have been wholly unaware of some fairly severe faults.

HYDROELECTRIC

Performance of a New Magnetic Amplifier Type Voltage Regulator for Large Hydroelectric Generators. G. B. Kallenbach, *Niagara Mohawk Power Corp*, F. S. Rothe and H. F. Storm, both *General Electric Co*; P. L. Dandeno, *Hydro-Electric Power Commission of Ontario*

Amplistat-supplemented amplidyne renders same function as on steam-electric systems whether transmission from hydro generation is long distance (HEPC) or comparatively short (N-M).

Application of Hydrostatic Lubrication to Vertical Water Wheel Generator Thrust Bearings. J. E. Housley and T. L. Corey, both *Aluminum Co of America*; G. E. Peterson, *Westinghouse Electric Corp*

Oil pump rated 3 hp, 2,000 psi provides hydrostatic lift and film of oil for safe starting and wearless stopping of unit operated frequently for peaking purposes.

An increasing role for static devices for voltage regulation was seen by C. V. Valentine, Westinghouse, despite the fact that it may not reduce the number of rotating devices applied. Rothe gave assurance that stable operation during removal of the amplidyne can be had with hand control.

Neither resort suggested in the Housley-Corey paper appeared necessary to P. M. Hess, Penn Water & Power Co. He prefers avoiding the risk of vulnerability incurred with extra auxiliaries. His company's units have undergone over 100,000 stops and starts with acceptably low maintenance and with readiness to start on 20-second notice. J. P. Frazer, British Columbia Electric, also believed well-designed Kingsbury thrust bearings give long-time, trouble-free service. Shawinigan Water & Power felt (Sharpe and Hough) that there is, however, a critical minimum speed below which it is not desirable to operate for any length of time. Operating temperature is, on the other hand, the critical index of the Los Angeles Department of Water & Power, and F. R. Gould expressed preference for a self-equalizing type of bearing.

CONTROL CABLES

Four conference papers on station control, station auxiliary and airport cables brought to the surface in discussion the still unsolved problem of accelerated aging tests. That in turn lead to discussions of the confidence in and probable life of the new synthetic insulations and conductor coverings. Survey by the insulated conductor subcommittee (W. T. Pierce, chairman, presiding and presenting) had indicated that 55% of the power and industrial users prefer conduit or ducts to trays or burial, a great majority like No. 9 and/or No. 12, most want 19 strands, 41% prefer oil-base rubber (14% are PVC and 1.5% for PE) with 61% expressing choice for Neoprene covering (only 22% for braids, 15% for PVC, and 2% for lead).

George Landis, Central Hudson Gas & Electric Co, M. F. Clement, Rockland Lt & Pwr.

Poor performance of earlier types of control cable on the Philadelphia Electric system, recounted by U. S. Shuman, led to standardization on oil-base insulation but did not exclude trial installations of the synthetics. Primary dependence on "know-how" and field studies was the Okonite attitude on the new materials as expressed by E. E. McIlveen and R. C. Waldron. It was based on multiplicity of prevailing compoundings of the synthetics not to mention the fillers, stabilizers, accelerators, etc. Calculations are largely meaningless, and speed-up tests can hardly simulate all field factors. Manufacturing and field experience they said are the dependable guides. The other school was partially reflected by G. J. Crowdes, Simplex Wire & Cable, who said controlled testing is a valuable predictive tool but predictions and projection into long-term use should be made only for known or explored environmental conditions.

S. J. Rosch, Anaconda, said the user himself will have to contribute the final answer, acknowledging that accelerated aging is inadequate. He thus sided with Henry Richter, Ebasco Services, who had called the situation an uncomfortable one for utilities having to place so much reliability dependence on control cables in power stations without ample positive confirming information. Rosch, however, said this is a day of new materials—without them rubber would not have been available recently to meet the insulation demands. He cited a 16-year usage of PVC in this country, nor would he hesitate to recommend polyethylene for certain limited situations.

SWITCHGEAR

Considerations in Testing, Rating, and Application of Power Circuit Breakers. B. Evans and C. L. Killgore, both *Bureau of Reclamation*

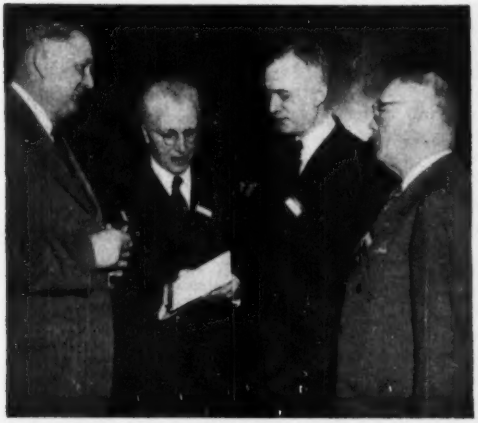
Rating and testing of circuit breakers should be based on symmetrical currents and should include design transient voltage value, interruption of charging current, and repeated operations without maintenance. De-rating factors should be eliminated.

Correlation of Interrupting Rating and Application of Power Circuit Breakers. J. A. Elzi, *Commonwealth Services, Inc*

Proposed definitions of interrupting current rating are restrictive; present definition should be retained. Duty cycle of O-O sec-CO should be adopted. Interrupting rating tests should include one full cycle after contact parting.

V. P. Brodsky, Consolidated Edison; C. R. Johnson, Port of N. Y. Authority; A. B. Henderson, Consolidated Edison; (seated) W. A. Frankenfield, Detroit Edison and F. P. Brightman, General Electric

C. V. Roseberry and H. N. Muller, Jr. both of the Westinghouse Electric Corporation, East Pittsburgh, Pa., and W. A. Lewis, Jr., Illinois Institute of Technology, Chicago, Ill.

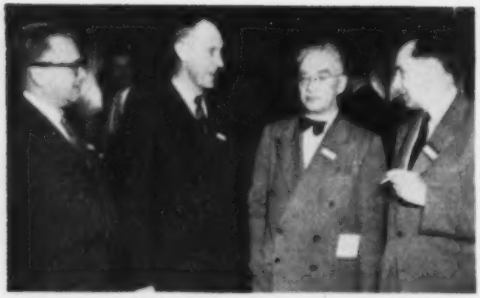


S. B. Crary, GE; I. W. Gross, AG&E Service Corp; R. Langois-Berthelot, Electricite de France; and N. B. Hinson, (Director) So Cal Edison

James A. Rawls, Virginia Electric and Power Company; C. H. LeVee, Fagan Electric Company and J. M. Flanigen, Georgia Power Company

C. W. Watchorn, A. N. Shealy, both Pennsylvania Water & Power; V. L. Dzwonczyk, AG&E Service; and J. Q. Wray, Jr, PW&P

J. E. O'Brien and L. B. Crann, both Rural Electrification Administration in Washington, D. C., and D. K. Blake, General Electric



A. K. Lauthold, Brown Boveri & Co of Canada; H. Meyer, Brown Boveri & Co; A. Dovjikov, Bonneville Power; and O. Naef, AG&E

J. F. Getz, I-T-E Circuit Breaker Company; and J. M. Geiger, G. M. Pollard and J. L. Harvey, all of Niagara Mohawk Power Corporation

The Effect of Current Asymmetry on Circuit Interruption. W. F. Skeats, *General Electric Co*

If oil circuit breakers can be tested under worst timing conditions, asymmetrical currents provide interrupting duty at least as severe as does equivalent rms symmetrical current. Conditions of offset should be specified.

Short Circuit Ratings of Power Circuit Breakers. R. C. Van Sickle, *Westinghouse Electric Corp*

Breaker application can be simplified by describing short circuit characteristics in terms of alternating component of first cycle current which breaker can close, carry, and interrupt.

Considerations in the Rating and Testing of Power Circuit Breakers. H. P. St. Clair and O. Naef, both *American Gas & Electric Service Corp*

Interrupting ratings should be based numerically on maximum symmetrical interrupting current only but should include interrupting and making asymmetrical current containing rated symmetrical component and up to 80% of dc component.

Continued interest in the adoption of a new method for rating power circuit breakers was evidenced. O. Naef, American Gas & Electric Service Corp, agreed with author Van Sickle that crest value of the alternating component of initial current peak is a better criterion for determining maximum interrupting rating than rms value of the initial peak. He cautioned that comparison of severity of interruption tests, based on tank pressures produced during interruption of symmetrical and asymmetrical currents, will be misleading if the tests are picked at random.

E. J. Harrington, Bonneville Power Administration, stated his company's experience shows that control of both degree of asymmetry and contact parting time are essential if breaker is to be rated on basis of comparatively few tests. He felt that author Van Sickle was conservative in comparing severity of interruption on rms value of interrupted wave.

Concurring with authors Van Sickle and Skeats on relationships between severity of interruption and rms value of current, D. E. West, Allis-Chalmers, said that air-blast breakers can interrupt asymmetrical currents with less difficulty than symmetrical currents. Because of the great number of oil breakers in use in this country, he agreed with author Elzi that rating on an rms value basis should be retained. Rating on basis of peak value of alternating component would entail too many considerations in applying breakers to a system, he said. F. A. Lane, American Gas & Electric Service Corp, felt that both peak value and rms value should be considered in revising present methods of rating. He seconded conclusions of authors Evans and Killgore that derating factors be eliminated because they are unrealistic and leave doubt in the user's mind as to actual capacity of switchgear. Lane agreed with author Elzi that the present duty cycle is an unrealistic, arbitrary compromise and that a realistic duty cycle be established.

High Speed Multiple Reclosing Oil Circuit Breaker for 161 Kv, 10,000,000 Kva. B. P. Baker and G. B. Cushing, both *Westinghouse Electric Corp*

The multiflow, self-generated pressure type of interrupter interrupts 25,000 amp at 230 kv and 36,000 amp at 161 kv, performs multiple interruptions at short time intervals; and proves the practicability of finger contacts to handle large, continuous and momentary currents.

High Voltage Circuit Breakers in the Bonneville Power System. O. A. Demuth and A. Dovjikov, both *Bonneville Power Administration*

Operational characteristics of new breakers with increased interrupting capacity or operating voltage cannot be extrapolated from experience with older breakers of lower capacity and/or voltage.

Ultrahigh Capacity Field Tests on 230-Kv Air-Blast Circuit Breaker at Grand Coulee Power Plant. A. C. Conger and C. L. Killgore, both *Bureau of Reclamation*, and W. Wanger, *Brown, Boveri & Co*

Breaker interrupted current without restrikes, handled power well above rating and in high-speed reclosing operations with 13-14-cycle reclosing times, and showed extremely light contact erosion after nine interruptions.

Out-Of-Phase Switching Voltages and Their Effect on High-Voltage Circuit Breaker Performance. W. M. Leeds and D. J. Povejsil, both *Westinghouse Electric Corp*

Dynamic voltages up to 2.5 times normal plus 25-60% transient overshoot are theoretically possible, even on well grounded system. Permanent faults under out-of-phase conditions do not increase maximum recovery voltages on breakers.

Answering the implication in the paper by Demuth and Dovjikov that oil breakers present great hazards to personnel and adjacent equipment, F. A. Lane said that air breakers present hazards which are equally great. Maintenance on both types is roughly equal but inability of air breakers (and oil-poor breakers) to use bushing current transformers is a serious limitation. Lane said paper by Leeds and Povejsil was reassuring in that maximum disfavorable conditions as outlined seldom exist on present systems.

D. P. Reeks, General Electric Co, questioned the unusual emphasis in the Baker-Cushing paper on ability of the 10,000 Mva, 161-kv breaker to reclose as fast as possible. He also questioned whether two-cycle contact parting time would allow the device to be a true three-cycle opening breaker. E. J. Harrington said more data is needed

J. E. Clem, G. E.; H. A. Cornelius Public Service Co of Northern Ill; C. E. Parks, Public Service of Ind; P. L. Bellaschi, Consulting Eng

F. H. Stopplemann, Westinghouse; P. H. Adams, P. S. Electric & Gas; E. B. Shew, Philadelphia Electric; E. S. Banghart, Penn. Transformer

on the problem of deciding the number of interruptions, and the value of kva interrupted each time, which can be tolerated under an integrated kva interrupting duty scheme before inspection is necessary. W. M. Leeds, Westinghouse Electric Corp, pointed out that American manufacturers will continue their emphasis on oil breakers, in spite of BPA's opinion that air breakers are the interrupters of the future.

SUBSTATIONS

Basic Structural Design for Substations Including Light Metals. AIEE Committee on Substations Project No. 8

Substation structures classified by types. Factors influencing choice of types enumerated and types of materials compared on basis of first cost, erection and maintenance expense, permanence, etc. Design loadings and stresses, standardization discussed.

Automatic Phase Angle and Voltage Control of Unattended Marcus Hook Substations. W. A. Derr, *Westinghouse Electric Corp*, F. H. Travers, *Philadelphia Electric Co*; and R. M. Jolly, *Public Service Board of San Antonio*

Factors influencing selection of TCUL step-down transformers and phase angle transformers at Marcus Hook substation. Choice of equipment, automatic control, regulators and supervisory discussed.

Comments on the AIEE committee report on the use of aluminum in substation structures drew confirmation from F. L. French, Aluminum Co of Canada. He warned that engineers should approach the design of aluminum structures with a different point of view than with steel. Use of the same design principles for aluminum as for steel is wasteful. In preference to tubular columns of aluminum, suggested in the report, he proposed use of a partially-closed "top half section". Resulting structures weigh 30% of steel and may bring the metal to the fore, taking advantage of its properties. J. H. Rixie, REA, also pointed out that all substation design considerations need not be based on cost and past practice, but that availability of metals should be a factor in substation designs.

A conference paper by A. H. Powell and C. B. Hinton proposed standardization of outdoor substation structures based on two components: Lattice columns for substations ranging 69-115 kv and individual towers above 115 kv. A life of 12-15 years was placed on such structures using 3/16 in. galvanized steel shapes. Comparing bus constructions, the authors favored strain construction for economy reasons with the qualification that tubular bus construction uses less steel. While applauding trends toward standardization, S. C. Killian, Delta-Star, noted that the economy of a basic standard structure depends on how carefully design criteria are set up. He warned, for example, against the effect of using higher than necessary bus tension, thus dictating heavier member throughout.

Results of a preliminary survey of substation grounding practices were cited in a conference report by the working group of the committee on substations. It showed that 16% of 61 reporting companies have no established standard for minimum ground resistance. However, 31% require 1 ohm or less, 53% 3 ohms or less and 80% 5 ohms or less. Out of the 61 respondents less than half reported making routine inspections of substation grounding systems. Multiple ground rods, interconnected by a network of conductors was preferred method of establishing a station by an overwhelming number of those replying. However 42% do resort to use of a buried plate or loop on occasion. Separate ground leads for lightning arresters were provided by 80% in preference to depending on metal substation structures.

TRANSFORMERS

Field Tests on Power Transformers Equipped With Thermosiphon Oil Filters. E. W. Tipton, *Westinghouse Electric Corp*

Tests show filter more effective in maintaining initially low acidity than restoring deteriorated oil. Life of 5 to 15 years expected from filter with 75 lb clay per 1,000 gal oil depending on load cycle.

Controlled Temperature and Insulation Protection in Operation of Power Transformers. W. W. Satterlee, *Westinghouse Electric Corp*

After eight years of life test begun in 1943, transformers with sealed tanks equipped with filters are in best condition, compared with those exposed to the breathing of moisture and oxygen.

The Economics of High-Temperature Dry-Type Transformers. L. C. Whitman, *General Electric Co*

Finds savings to user of open-dry-type transformer designed for higher temperature rises to be smaller than 3%. Find Class H open dry type has cost premium of 10% over Class B. Temperature rise to realize 1-10% savings with sealed dry type designs must be in range 180-230 C with 240-300 C hot spot.

Characteristics of Overlapping Joints in Magnetic Circuits. T. D. Gordy, *General Electric Co*, and H. L. Garberio, *Armour Research Foundation*

Joint effects small for flux densities below 60-70 kilolines per sq in. Overlapping joints do not increase core less more than variation between cores of same design.

A New Concept of Insulating Oil Life Characteristics. Frank C. Doble, *Doble Engineering Co*

Laboratory studies show combination of proper reclamation plus in-

B. M. Jones, Duquesne Light; E. B. Shaw, Philadelphia Electric; W. B. Morton, Penn Power & Light; and D. D. Chase, Detroit Edison

E. V. Sayles, Consumers Power; L. W. Clark and W. A. Hirt, both Detroit Edison; and N. N. Smeloff, Pennsylvania Power & Light

hibition with DBPC makes possible conservation of old oil now in service. High degree of re-refining not necessary.

A new concept of the operating characteristics of insulating oil, advanced in the Doble paper, maintains that sludging of insulating oil can be prevented by re-refining with Fuller's earth and addition of DBPC inhibitor. F. A. Lane, American Gas & Electric, commented that since oil maintenance has now reached a high degree of perfection, attention should now be given to developing an oil that requires little or no maintenance and designing transformers that oil deterioration does not effect. We need to know how oil deteriorates, he said, and what the relation is of oil to insulation deterioration. In closure, Doble presented laboratory data, showing physical deterioration of transformer paper that had been immersed in both inhibited and uninhibited oil of different degrees of refinement. Insulation deterioration of samples immersed in one grade of inhibited oil was shown to be worse than that in uninhibited oil. Yet insulation in a different grade of inhibited oil showed excellent properties. Doble explained that the performance might be traced to something that happened to the oil before inhibitor was added.

M. L. Manning, Pennsylvania Transformer, challenged load factor assumptions of Whitman's analysis of dry type transformer economics, on the ground that load factor and core and coil losses vary widely giving transformer designers a great deal of latitude.

F. A. Lane, American Gas & Electric, observed that if copper gets much more stringent, engineers may some day be forced to substitute losses for copper in transformer designs. Until then they should explore and agree on a figure for capitalized losses. Savings on system components can offset increased losses and regulation and result in conclusions different from Whitman's, C. P. Xenis said. In explanation he showed how expensive system changes can be avoided if existing manholes can be made to house equipment of higher rating. H. D. Braley, Ebasco, said that when dry type transformers are used in station auxiliary service reliability is vital; price and efficiency secondary.

The Impulse Testing of Low Voltage High Kva Transmission Windings. L. C. Archer, *Allis-Chalmers Mfg Co*

Calls for these changes in standards of impulse testing of high capacity transformers: Shorter than 40 microsecond wave trails; revise maximum time to crest of test loads below 650 kv to 3.0 microseconds; solid grounding of terminals other than winding under test.

The Impulse Generator and Its Uses. J. H. Chiles, Jr and William L. Teague, both of *Westinghouse Electric Corp*

How modern impulse generator is used in manufacturing, for development work, verification and quality control, detection of failures. Analyzes significance of equipment failures under impulse tests.

Gaseous Insulation For High-Voltage Transformers. G. Camilli and R. E. Plump, *General Electric Co*; G. S. Gordon, Skillman, N. J.

Data on electrical and chemical properties of Sulphur-Hexafluoride (SF_6). Breakdown products toxic in high concentrations but are easily absorbed by sodium hydroxide or activated alumina. Heat transfer lower than liquid insulation. To equal oil's dielectric strength must be held at these atmospheres.

Recent Improvements In Theory and Practice of Vacuum Plastic-Filled Insulation for Voltage Transformers. E. C. Wentz and F. B. Corby, *Westinghouse Electric Corp*

Vacuum-compound-filled transformers improved by use of new crepe paper insulation structure; foam rubber expansion absorbent that provide lower insulation power factor, more resistance to loss of dielectric strength at low temperature and less tendency to leak.

Authors and discussers of papers on impulse testing were in virtual agreement that simplification of standards for testing is practicable, that it will permit the testing of more transformers and that the simplification can be achieved without sacrificing the objectives of impulse testing.

J. H. Hagenguth and J. R. Meador, General Electric, proposed application of a reduced (50%) full wave followed by two full waves at BIL as consuming a minimum time and making full use of the neutral current method of failure detection.

Proposal of the Chiles-Teague paper was two chopped waves followed by two full waves at 5% of ASA impulse test levels. F. J. Vogel, Allis Chalmers observed that full waves and chopped waves are not similar and do not stress insulation in the same way. A. F. Rohlfs, General Electric showed cases where reduced full wave test revealed failures that chopped waves did not. He cautioned against complete elimination of the full wave test.

G. W. Muller and W. L. Teage, Westinghouse, concurred with the Archer paper that length of the tail of test waves could be shortened without harm and time to crest be held to 3 microseconds as proposed. If one test was to be selected over others, they favored full wave as being simplest and getting most failures.

P. L. Bellaschi, too, felt the full wave test was very important; chopped wave and reduced wave supplementary. H. L. Rorden, Bonneville Power urged that any simplified test selected

to be the one most closely simulating service conditions.

J. Hagenguth said change from steep to chopped wave was in the correct direction.

CARRIER CURRENT SYSTEMS

Proposed Definitions Relating to Power Line Carrier. Project Committee of AIEE Carrier Current Committee

A compilation of terms used in carrier practice and their meanings as they differ from telephone terminology.

A Power Line Carrier System for Maximum Channel Utilization. John A. Doremus, *Motorola, Inc*

A new carrier system allows more channels to be placed in the usual spectrum. Use of a single-section, high-pass filter solves problem of coupling many circuits to a single line with a single coupling capacitor.

Carrier Frequency Characteristics of Power Transformers. T. R. Specht and R. C. Cheek, both *Westinghouse Electric Corp*

Results of tests on power transformers in the 69-kv or higher class. High voltage transformers generally present capacitive reactances of medium to high Q. Autotransformers may resonate at frequencies within the carrier spectrum.

Input Filter Design for Frequency Modulated Power Line. R. L. Fillmore, *University of Minnesota*

To keep harmonic distortion to a minimum the receiver input filter must have a wide pass band. Phase characteristics must be nearly linear and symmetrically shaped.

The proposed definitions relating to power line carrier were well received by the discussers. J. C. Carter and F. Duncan, both of Westinghouse, felt that all technical terms used in the carrier field, even those common to other fields as telephony, should be included in the one paper on definitions.

The question of measurements on the low voltage side of power transformers at carrier frequencies was raised by S. Lubin, Sprague Electric. His query was aimed at gaining data pertinent to carrier use on distribution lines. E. W. Brown, Kentucky Utilities, felt power transformers had higher capacities than stated in the paper. This was based on problems encountered on the company's 66-kv lines. S. C. Bartlett, AG&E, was interested in learning what effect transformer loading had on the capacity of power transformers at carrier frequencies. It was admitted that such data would be difficult to obtain in test.

The Doremus paper on power line carrier systems for maximum channel utilization was agreed to be a step in the right direction. Gunter, Westinghouse, felt this type carrier was new under ideal conditions only, but that under present operating conditions it was not a new idea.

SLEET MELTING

The conference on sleet melting drew enthusiastic response from a large audience, Thursday A. M. Six companies participated in reporting their methods of sleet prevention and sleet melting.

Factors contributing to Pennsylvania Water & Power Co's freedom from sleet trouble were listed by A. H. Shealy, K. L. Althouse and R. N. Youtz as these: (1) Adequate line design; (2) Maintenance of the clearance; (3) Use of horizontal conductor configuration; (4) High speed relaying to prevent burndown, and (5) Use of mobile radio for observation and dispatching.

New England Electric System, too, favors horizontal line configuration and seeks to build flexibility into structures, subject to sleet, according to C. P. Corey, H. R. Selfridge and H. R. Tomlinson. The system has 450 miles of 69 kv and 50 miles of lower voltage line equipped for sleet melting capable of clearing lines of ½ in. ice in 30 minutes. A sleet melting team of 40 men located at 27 points on the system are ready for call. Fifty observation points provide temperature and weather data. They are supplemented with sleet detectors on carrier communication circuits activated by signal attenuation. In 10 years sleet melting has been used in 202 instances, some unnecessary. Eight system setups for sleet melting were described.

Niagara-Mohawk's three methods of sleet melting, were detailed by H. B. Smith and W. D. Wilder. They are these: (1) Load current method, used for preventing sleet formation rather than for melting; (2) Short-on-generator in which a three-phase short circuit is applied at the far end of the line and generator field upped enough to give necessary melting current; and (3) Short-on-bus by which melting current is obtained by short circuiting the far end of a line with normal bus voltage applied. Tables of melting current were given.

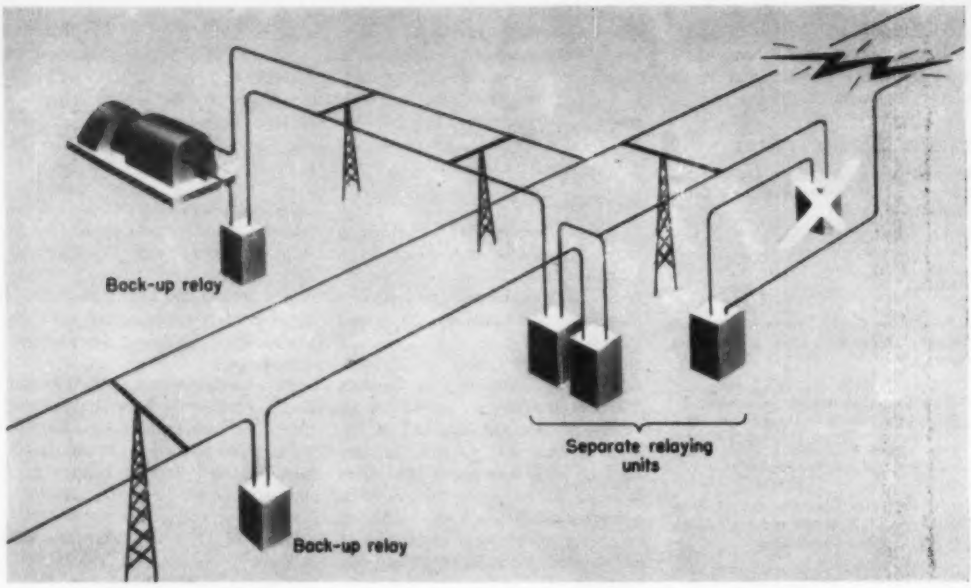
Sleet melting practice of American Gas & Electric Co have changed but little since 1939, authors S. C. Bartlett, C. A. Imburgia and G. H. McDaniel said. Detailed tests of melting current required for de-sleeting ultra-high voltage line conductors showed that currents of 1200 amp were required to melt ½ in. ice from 330 kv conductors of 1,290,000 cir mils using 132 kv source potential. Time to melt was 2 hours. Line lengths were 85 miles.

Detroit Edison, according to D. D. Chase, has found airlines the best source of information on icing conditions. Study of line impedance of Detroit's 120-kv lines has shown 30-32 miles the ideal length for de-icing and 50-55 miles for 40-kv de-icing. It was found possible to group lines in combinations so that about these lengths could be set up for all copper circuits and not interrupt the complete source of feed to the area.

V. L. Davies and L. C. St. Clair reported that Public Service Co of Northern Illinois is experimenting

(*Continued on page* 175)

E. A. Childerhose, Jackson and Moreland Engineers; T. Broaten, City of Norwich, Connecticut, Gas and Electrical Department; H. A. Squires, Howard H. Squires Company, Boston, Mass.



SIMPLIFIED DIAGRAM shows how separate relaying scheme coordinates with front-line relaying. Upon failure of relay and associated breaker at right to isolate a fault, back-up units may not operate if division of fault current between sources results in less than minimum pick-up current in each line. To eliminate this condition, separate relaying will operate to trip all breakers feeding the fault

Complete Your Back-Up Protection Of Transmission Lines . . .

. . . with a separate relaying scheme set to coordinate with front-line relaying. Relaying is designed to protect transmission lines fed from buses having multiple sources

A. J. McCONNELL, Relay Application Engineer
Central Station Engineering Division, General Electric Co, Schenectady, New York

Complete back-up protection for transmission lines fed from a bus having multiple sources can be obtained by using a separate relaying scheme arranged to trip all the breakers on the bus. In this scheme a separate relay unit or a separate relay set to coordinate with front-line relaying may be used.

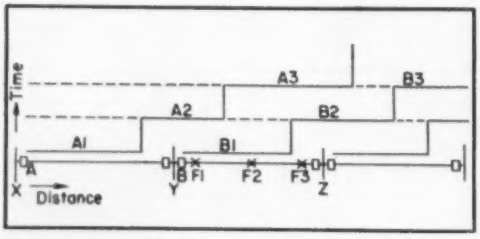


FIG 1—IDEAL SITUATION for stepped-distance type relays having three separate zones is sectionalized transmission line having no intermediate sources of supply. For faults as shown, relay A is back-up protection for relay B in the event that breaker B fails to open

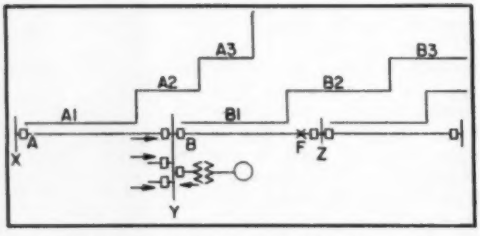


FIG 2—REALISTIC SITUATION is obtained by adding a multi-source bus at Y to situation of Fig 1. With fault at F beyond reach of the third zone of relay A, failure of breaker B to open may result in loss of all automatic tripping facilities on the transmission line

Problem and Solution . . . Basic cause of back-up relay difficulty is multiple feeds to station buses. A fault on a line connected to such a bus will result in a division of short-circuit current among the various sources. Each source may supply short-circuit current well under its normal load current, especially if the fault is at the far end of the line. Consequently, upon failure of the faulted-line breaker to open, relays on other lines (or generators) may not "see" the fault.

The solution lies in the ability of back-up relaying to operate in response to current in the faulted line only, and to trip all source breakers on the bus if front-line protection fails. The basic solution should include back-up protection for failures of these types: (1) Failure of supply voltage (ac or dc) or current to reach front-line relays; (2) failure of relays; and (3) failure to clear after correct relay operation.

In our solution we can use either a separate back-up relay or a back-up relay unit energized by current in the faulted line and connected for time-delayed trip of all source breakers (or all breakers) connected to the bus. Proposed back-up protection is not limited to relays of the distance type, but in our example we will assume the stepped-distance relay is used.

Analysis of the Solution . . . The stepped-distance characteristics of type GCY relays, having three separate "zone" units, are shown applied to an ideal situation in Fig 1. Unfortunately, such a situation is seldom realized. To obtain a situation which approaches existing systems, several sources of short-circuit current—two lines and one generator—may be added to bus Y as shown in Fig 2. With a fault on the line between buses Y and Z, back-up zone A3 of relay A may not include all of the line between Y and Z. Failure of breaker B to trip for fault F may result in complete loss of automatic tripping.

The obvious answer is to increase the reach of the back-up zone A3 so that it will always operate for a fault on bus Z. However, experience has indicated that such a "solution" results in reduced load-carrying ability of the lines connected to bus Y. It may be quite impossible to set relays facing bus Y to see all faults on other lines, and yet be sufficiently insensitive to permit the line to loaded to its full capability.

The proposed back-up solution differs from the orthodox method only in the distance settings of the back-up units (A3 and B3), and in the breakers tripped. In Fig 3, distance settings of back-up units A3X and B3Y are reduced below the intermediate-zone settings (A2 and B2). Each back-up unit trips all source breakers (or all breakers) on its bus, as indicated by the letters X and Y. (It will be assumed hereafter that all bus breakers will be tripped.)

Various Fault Locations . . . Faults F1 to F4, inclusive, in Fig 3 show the four fault areas calling for different relay action.

Fault F1—Unit B2 of relay B should trip its breaker in intermediate time. If the fault is not cleared unit B3Y trips all the Y-bus breakers.

Fault F2—Unit B1 of relay B should trip its breaker in instantaneous time. If the fault is not cleared, unit B3Y trips all the Y-bus breakers.

Fault F3—For a fault lying between the A2 and A3X distance settings unit B1 of relay B should trip its breaker in instantaneous time. If the fault is not cleared, unit A2 of relay A trips its breaker. Corresponding remote relays on other lines on bus Y may or may not trip their breakers, according to their settings, but any sources not removed will be tripped by B3Y.

Fault F4—For a fault lying between breaker B and the A3X setting, operation will be substantially the same as for fault F3 except that more lines out of bus Y may trip at the remote line terminals. It should be noted that although fault F4 is within the setting of the A3X unit of relay A, only breaker A on bus X will trip because unit A2 has tripped breaker A, thereby resetting A3X before it has had a chance to operate.

In this example, it is assumed that one simply resets and reconnects the third-zone unit of the distance relay. In the case of the type GCY relay, this assumption is not too unreasonable. However, complete back-up protection would appear to require that the back-up relay be a separate relay and in a separate case.

A Refinement . . . The basic solution of the back-up problem has been partially recognized by those who trip the bus breakers through a timer energized from the trip terminals of the line relays. Timer setting is such that it will not time out if line relays remove the fault as anticipated. This method provides for back-up protection only if the breaker fails to trip when a trip voltage appears on the relay trip terminal.

On the other hand, back-up protection will be faster than with the proposed method if front-line relays operate in instantaneous time. It is then necessary to wait only for an interval corresponding to second-time zone, rather than third-time zone.

Advantages of both methods can be obtained simply by combining them. The resulting time-distance characteristic is shown in Fig 4.

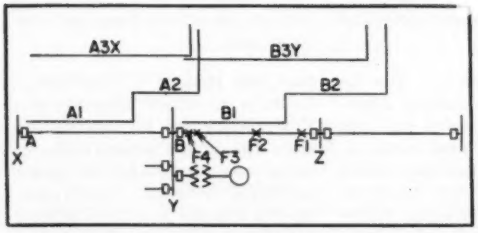


FIG 3—PROPOSED SOLUTION calls for distance settings of back-up units A3X and B3Y to be reduced below intermediate zone settings A2 and B2. Each back-up unit will trip all the breakers on the bus which are not tripped by the intermediate zone settings of the relay

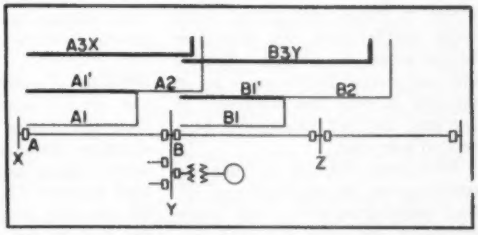
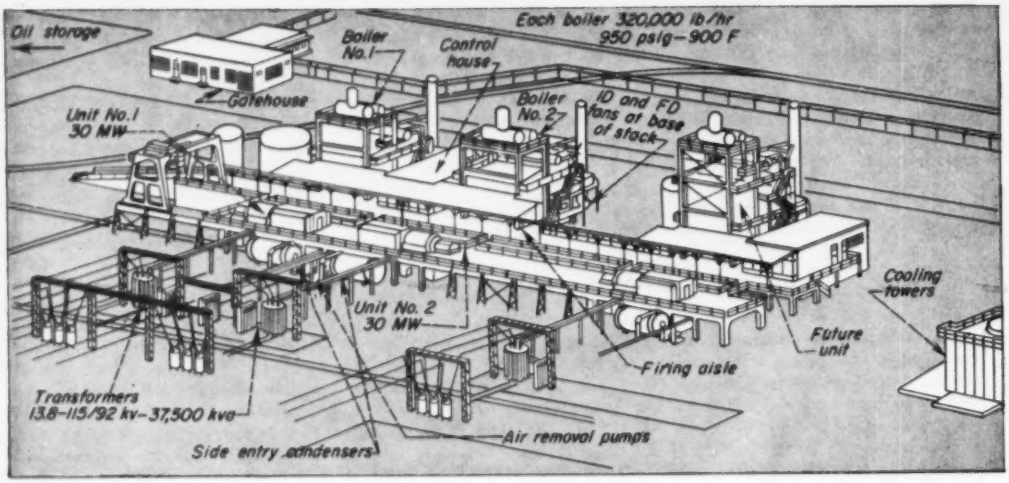


FIG 4—REFINED SOLUTION makes use of timer to introduce a time delay into operation of zone settings A1 and B1 and produce the characteristics represented by A1' and B1'. Timer will not time out if line relays operate to remove the fault in a pre-determined manner



LESS EXPENSIVE FOUNDATIONS and easier bracing for earthquake shock are direct benefits of reducing building height by use of side-entry condensers at Highgrove Station of California Electric Power Co. Only enclosure in plant proper is that for control room

Side-Entry Condensers Cut

California Electric Power Co saves a third on lower foundations requiring less earthquake bracing. Box-like, steel plate housing for turbines eliminates expensive custom-built job. Locating most equipment on ground level in view of control room permits 4 men to operate 30-Mw units

OTTO HEDRICH, Project Manager, Fluor Corp, Los Angeles

Side-entry condensers, completely outdoor construction with locally fabricated metal housing for the turbines, and careful attention to layout for minimum operating costs distinguish design of the new Highgrove steam plant of California Electric Power Co. Use of the side-entry condenser helps keep building height to a minimum. All rotating equipment except the main turbine-generator is located at ground level, easily visible from the glass-front control room. As a result, when the first and second 30-Mw units go on the line in June and September of this year, they will be operated by a crew of four men.

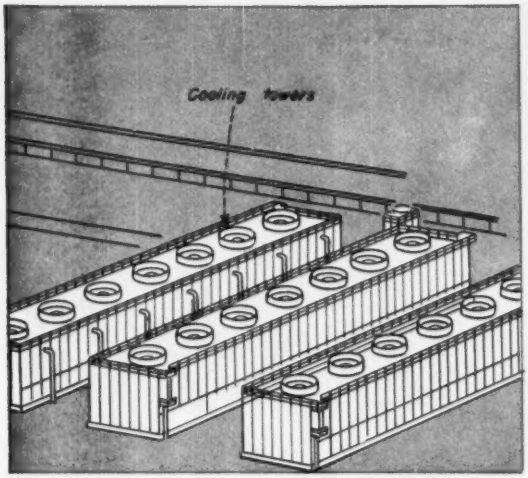
With design emphasis on minimum operating cost, the combination of outdoor construction with a unit system employing preferred standard machines will keep down over-all plant cost to approximately $140 per kw for the first two units. Addition of two 40-Mw units by 1954 will reduce this to an estimated $135.

Only significant differences between the first two and last two units will be use of isolated phase bus and higher steam pressures and temperatures on the 40-Mw machines. Equipment common to any two of the units includes control room, circulating water lines, water treatment apparatus, water supply, fuel supply, spare exciter, start-up transformer, and allied general facilities.

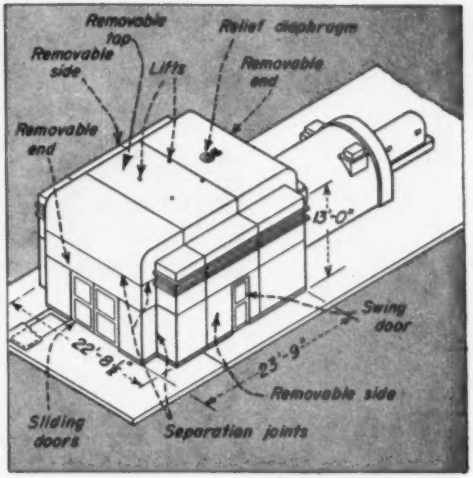
Side-Entry Condensers . . . This design offers several structural advantages contributing to lower cost construction. Reducing head room between turbine and condenser levels from the usual 19-22 ft to 14 ft with the side-entry condensers puts the firing aisle at this level and reduces foundation cost by about one third. The condenser is bolted to the ground-level slab, and lateral bracing required for earthquake shock is substantially less because of the lower foundation.

All rotating equipment with the exception of the main turbo-generator has been located at ground level, without any excavations or equipment below. Only disadvantages of the side entry construction are the small additional cost of the right angle connection for the exhaust and the somewhat indeterminate but minor pressure loss between the exhaust flange and condenser inlet.

Steel Plate Housing . . . One unusual feature is the locally fabricated steel plate housing for the outdoor turbines. Instead of a housing fabricated by the manufacturer to fit the general contours of the turbine, a simple modified box structure with removable top and sides is used. It provides ample room for ordinary access to any part of the turbine, and removal of the top suffices for most maintenance



Four men will operate first two 30-Mw units. Crew will be a foreman, man at control board, auxiliary control operator, relief man



LOCALLY FABRICATED enclosure for turbine is made of steel plate, has separately removable top and sides to speed maintenance work

Outdoor Plant Costs Still More

work. For major overhaul the sides can also be removed separately and stacked in a small space. Since the box is a simple steel plate structure, the company is able to put it out for competitive bids instead of having it tailor-made by the manufacturer of the turbine-generator.

In other details the outdoor construction follows well-established practice. Only enclosure in the plant proper is the control room, which fronts on the common firing aisle and is located between the two boilers and facing the main units. The 25-ft firing aisle is protected by a roof but has no sides other than the fronts of the boilers and control room. Splash-proof motors are used on all auxiliaries with the exception of the cooling tower fans which are driven by totally enclosed fan-cooled motors.

Cost of the plant's gantry crane was kept to a minimum by designing it for 45-ton capacity, with the ability to make four 103-ton lifts required in the course of construction. The crane frame was designed to a stress of 30,000 psi corresponding to a factor of safety of 2 for these four lifts, required when the four generator stators are being set. Normal design stress on the frame will be 15,000 psi, with a factor of safety of 4. It will be rigged with equalizing double-reeving cable and two hooks to handle the unusual overload.

Cooling Water . . . Chemical control of water in the cooling towers presented a special problem because of difficulties of disposal of waste water from a treatment system. This ruled out use of water softening equipment which requires waste disposal. To keep down alkalinity to about 6.5-7.0 pH and retain calcium and magnesium in solution, sulphuric acid will be fed into the water in tower basins. Chlorine to control algae growth will be slug fed intermittently to the cooling water.

Highgrove Station, the only modern steam capacity on a basically hydro system, will operate as a base load plant. Anticipated average annual heat rate of the first two 30-Mw units is 12,500 Btu per kwhr. Operation will normally be on natural gas, with oil standby.

No extra money is being spent to provide for eventual conversion to coal burning. It is believed that the plant will be fully depreciated or obsolete by the time coal is competitive with gas or oil in this area.

VITAL STATISTICS

Highgrove Station, California Electric Power Co, near Riverside, Calif.

Units 1 and 2 scheduled for operation June, September, 1952

Turbines—850 psig, 900 deg F

Generators—30 Mw, 13.8 kv, hydrogen cooled

Boilers—320,000 lb per hr, 950 psig, 900 F design

Transformers—13.8-115/92 kv, 3 ph, 37,500 kva forced air cooled (no spare)

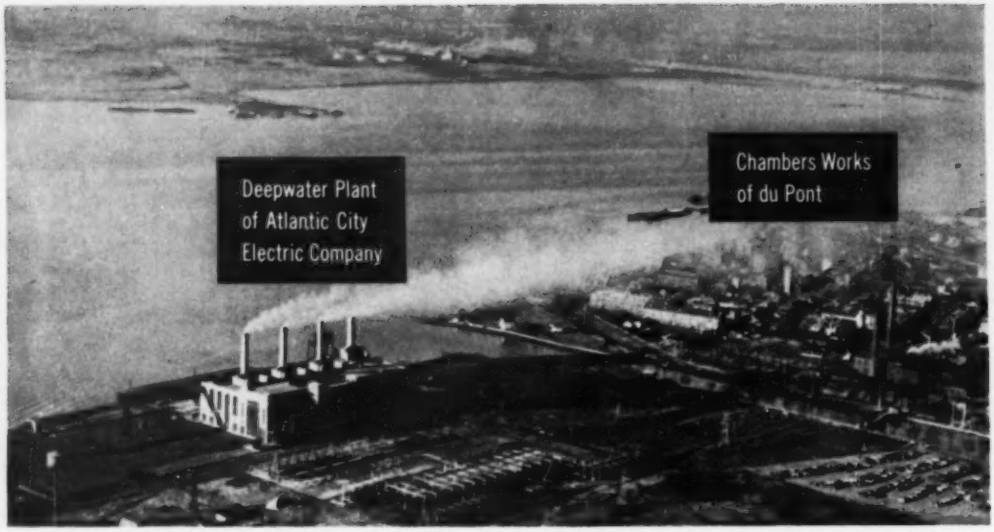
Boiler feed pumps—600 hp, motor driven, 2 per boiler, (either feed pump capable of supplying full load boiler requirements)

Forced draft fan (1) 250 hp, single speed, louver control

Induced draft fan (1) 350 hp, single speed, louver control

Auxiliary power supply—all motors over 100 hp, 2,400 v; smaller, 440 v

Air ejectors—mechanical positive displacement high vacuum pump type for removing non-condensable gases from condensers



FIRST CONTRACT between du Pont and Atlantic City Electric for electricity and steam was made over 20 years ago, a second in 1940. Deepwater Plant serves du Pont's Chambers Works. Under a third pact du Pont's Repauno Works will be served by utility's Greenwich Plant

20 Years of Teamwork to Go On Under 3rd Utility-du Pont Pact

Atlantic City Electric will have special unit in Greenwich Plant to supply electricity and process steam for nearby chemical company. Plan first tried at Deepwater Station

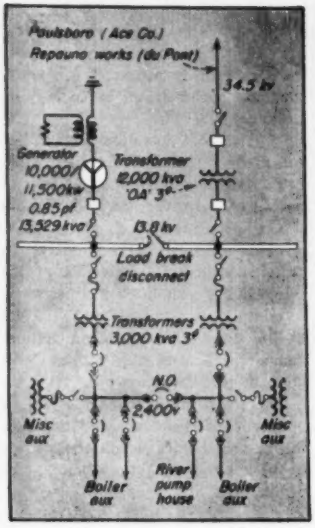
For the third time in 20 years, E. I. du Pont de Nemours & Co has signed a special service contract with Atlantic City Electric Co under which the utility will provide steam and by-product electricity to the chemical firm. The contract renews an agreement that has made it possible for du Pont to avoid investment and operating expense associated with ownership of steam and electric generating units in its own plant. It again demonstrates how teamwork between a great industrial enterprise and an electric utility can bring profits to both and benefits to the public.

This successful relationship has existed since 1928. In the interval, advances have been made in the technology of steam and power generation to which both organizations have made substantial contributions. Problems have been solved and the mechanics of operation worked out jointly with the equities mutually recognized so that after 20 years both firms were willing to enter into a third contract calling for expanded facilities.

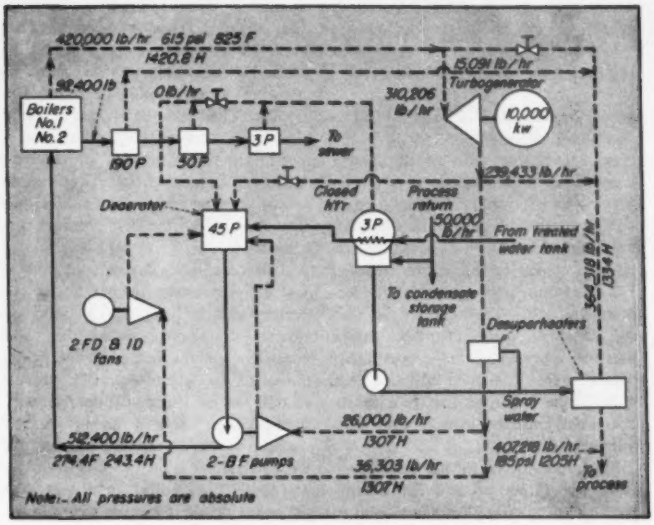
Under earlier agreements steam generated by Atlantic City Electric Co's Deepwater Plant was bought by du Pont at 1,200 psi and passed through two turbo-generators there that were owned and operated by the utility. Electric output of these 12,500 and 20,000-kw units belonged to du Pont as did the low-pressure process steam exhausted at 200 psi by the units. Both the process steam and the electricity from the units were used at du Pont's adjacent Chambers Works.

The most recent contract between the two firms calls for expansion of the former arrangement. Under it, Atlantic City will build Greenwich Plant incorporating a 10,000-kw unit from which electricity and process steam will be supplied to du Pont's Repauno Works near Gibbstown, N. J. The arrangement is similar to that at Deepwater. It also provides for a pumping station to deliver water to the du Pont works. Project is expected to be operating by September 1952.

How It Began . . . Atlantic City Electric Co serves most of the southern third of New Jersey, an area embracing 2,700 sq miles. In the northwest portion of this territory along the Delaware River, du Pont has located important elements of its great enterprise. Early facilities there date back to 1880 when dynamite was first manufactured by du Pont at the Repauno Works. Up until 1928, although du Pont was a customer of Atlantic City Electric, much of the company's power and process steam needs was generated by its own facilities in a manner typical of that period.



INTERCONNECTIONS exist between utility plant and lines and du Pont's Repauno Works



HEAT BALANCE DIAGRAM is shown for new 10,000-kw generating unit at the Greenwich Plant of Atlantic City Electric. Steam and by-product electricity will be sold to du Pont.

W. E. Caven, Chief Engineer, Atlantic City Electric Co

At that time Atlantic City Electric was a subsidiary of American Gas & Electric Co, which also controlled the utility system operating in Wilmington directly across the Delaware River. Both subsidiaries needed more power to meet growing load; so a jointly owned generating plant was projected to serve them. This type of plant was one with which the parent company had achieved much success in other areas. The site selected for the plant was on the New Jersey side of the river at Deepwater Point adjacent to which is now du Pont's Chambers Works.

At this time the du Pont plant also faced a period of expansion when it would require large quantities of steam and electric energy.

First Joint Station . . . Both du Pont and the utility recognized that attractive investment and operating savings could be achieved by housing equipment for the industry in the projected utility plant, operating all of the plant with a common operating and supervisory force. Accordingly, a contract, unique in the annals of utility history, was made. It was based on the following broad general principles:

1. The utility would install, own, and, operate all equipment.

2. Sale of steam would be at a high pressure, 1,200 psi. The electric energy generated by use of this steam would belong to the industry as would the lower pressure, 200 psi process steam.

3. Payments would be made in two general categories:

a Rental based on investment in equipment operated for the industry. Over a period of time this permits the utility to recover its investment plus a reasonable return on this sum.

b Operating expenses incurred on behalf of the industry to be repaid at cost.

4. Term of the agreement and termination provisions would be such as to offer reasonable security to the utility's investment.

Before the Deepwater Plant went into operation, Electrical World hailed it (May 11, 1929, p 919) as a "double purpose station." Others said it was a "new idea in central stations."

Through a series of corporate changes, ownership of half of the plant finally passed to Philadelphia Electric Co through its subsidiary, Deepwater Light & Power Co. Atlantic City Electric retained ownership of the other half. In 1950 the Atlantic City Electric Co acquired the assets of Deepwater Light & Power Co in the Deepwater Plant and is now the sole owner.

Contractual arrangements, set up under the broad principles outlined above, between the two owners and du Pont provided for:

1. Creation of a non-profit operating agency, the Deepwater Operating Co, to manage and operate the plant for the owners. The operating company was charged with the responsibility of carrying out the obligation of the owners to du Pont.

2. Installation of special equipment for service specifically to du Pont. This equipment was to supply the industrial firm with 250,000 lb of steam per hour and the electrical energy generated by this steam. As a variant of more common practice of selling process steam, the arrangements provided for the sale of steam at the throttle of the du Pont-designated turbine.

The contract provided also that du Pont be entitled to all of the by-product electric energy generated by the steam it purchased. But any power in excess of its needs would be accepted by the owners for use in their systems and credited to du Pont at cost of production. If the by-product energy should be insufficient for du Pont needs, Atlantic City Electric would supply this deficiency on a non-firm basis. In other words, the power

company's system acted like a fly wheel to absorb or supply energy when the industrial steam and power requirements were not in balance.

Initial Installation . . . First three turbine units were two 53,000-kw machines, for generation of the power companies' requirements, and a 12,-500-kw unit to supply du Pont's steam and electrical needs. The two 53,000-kw units were cross-compound machines, consisting of an 11,000-kw, 1,200-psi unit, and a 42,000-kw, low-pressure unit. The 12,500-kw unit was identical to the 11,000-kw high-pressure element of the power companies' units. It was so designed that it could be incorporated in a cross-compound unit if that were ever considered desirable.

Steam conditions for the Deepwater Plant were 1,200 psi and 725 F temperature, a considerable advance over the pressures then current, with a reheat temperature of 750 F. These steam conditions were influenced largely by the du Pont requirements for process steam and the corresponding electric energy, which were supplied in an unusual manner. The 12,-500-kw turbine and generator unit exhausted at approximately 400-lb pressure into a battery of evaporators fed by the return of hot water from the du Pont works. This was done to avoid the loss of condensate and the necessity of large quantities of treated makeup water for the high pressure boilers.

From this unit in the twenty-odd years of its operation, du Pont has taken 57,191,652,500 lb of steam and 1,911,900,260 kwhr of electric energy.

Second By-Product Unit . . . The success of the first operation led du Pont in 1940 to ask that the contract be extended and enlarged to meet its growing steam and power requirements. This resulted in the installation of a second unit under somewhat similar contract stipulations. However, certain changes were made to correct some of the difficulties that operation under the first contract disclosed.

This unit had a capacity of 20,000 kw and was served by one boiler operating at 1,200 psi, 900 F, with no reheat. In the 10 years that had elapsed since the first unit was built, engineers and chemists had developed techniques for successful operation of high-pressure boilers, using treated makeup water, so that no evaporators were needed.

The unit exhausts directly at 200 psi to the du Pont process steam lines. It also has operated successfully for over 10 years. Production of electricity has been 1,713,406,694 kwhr and of steam 31,335,956,059 lb.

The economics of installations such as these are elementary but deserve a few words of explanation:

1. The installation of equipment for an industrial company in a central station is much less expensive than if both users erected separate plants. This is true because it eliminates duplication of certain equipment which is necessary in a power plant though its use is only spasmodic. Included in such equipment are fuel handling and storage facilities and service facilities. Among the latter are the machine shop, station compressed air, control battery, store room, cranes, oil conditioning equipment, and laboratory.

2. The interconnection of both systems permits the use by the industrial user of the highest possible steam pressure. There is no need for worry about balancing steam and energy requirements.

3. Cost of operation and maintenance is much lower than if separate plants were operated. Thus investment economies are realized from the arrangement.

4. By-product electric energy is charged with an expenditure of between 3,500 and 4,000 Btu per kwhr in contrast with the 10,000 to 11,000 in the conventional modern station. Remaining heat of the steam is available for process operations.

There are other advantages to an operation of this type, but these are the principal ones which the parties to the contract sought, evaluated, and profited by.

Greenwich Station Project . . . North of Deepwater Plant, along the Delaware River, but close to the same group of plants that Deepwater supplies, du Pont is building at the Repauno Works, near Gibbstown, N. J., a plant for processing of chemicals used in its new fiber, Dacron Polyester. Needing steam and electric energy for the old and new operation of this plant, du Pont approached Atlantic City Electric for a supply under similar conditions to that from Deepwater. As a result in 1951 an agreement was signed under which Atlantic City Electric is building its Greenwich Plant.

Study showed that the immediate needs of both steam and electricity could be supplied by the installation of a 10,000-kw turbine-generator and the necessary boiler and auxiliary equipment. Construction of this plant has been started. It is expected to be in operation in September 1952.

Patterned along lines similar to the Deepwater arrangements, the plant, because of its proximity to Deepwater, will be operated and supervised by the Deepwater Operating Co, thus reducing the cost of supervision. The design also provides for a pumping installation at the river's edge to deliver 35,000 gpm of water to the du Pont works.

The Greenwich Plant site is large enough to accommodate a substantial utility plant addition. If load growth in this area demands it, the stage is set for an economical capacity addition to the Atlantic City Electric system.

CHAMBERS WORKS of du Pont has been getting steam and electricity from Deepwater Plant of Atlantic City Electric Co since 1930. The Delaware River Memorial Bridge is in background

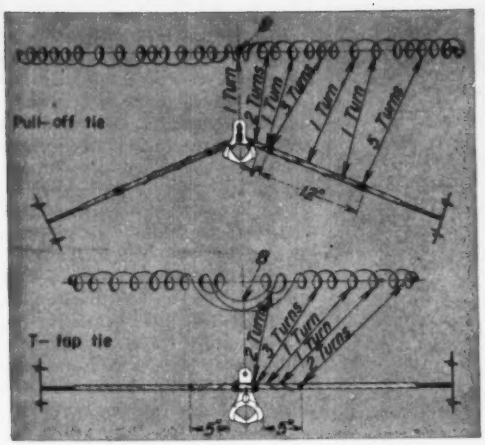


FIG 1—PULL OFF AND T-TAP ties are made in the same manner as for other types of conductors

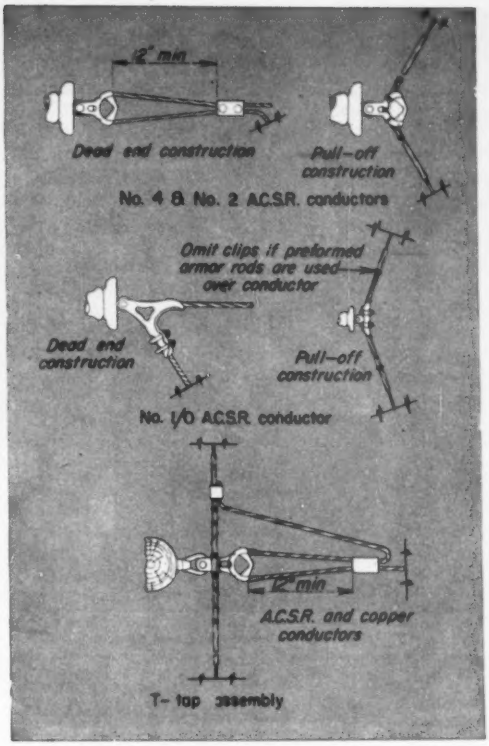


FIG 2—STANDARDS for dead end construction and pull off construction for different sizes of ACSR and for T-tap for ACSR to copper

C. E. TOPPING
Consumers Power Co, Jackson, Michigan

The "HOW TO" of Aluminum in Distribution

Some precautions are necessary, but no difficult problems have been encountered in building and operating 48,000 conductor miles of aluminum distribution

In the past 20 years approximately 17 million lb of bare ACSR have been installed on the Consumers Power Co distribution system. A saving of several million dollars has resulted. There are now about 20,000 circuit miles of ACSR in the distribution system, representing about 48,000 miles of single conductor.

While the use of aluminum has saved this company large sums, the lack of availability of copper and prospects of a continued shortage are prompting many companies to consider the possibilities of using aluminum conductors on distribution systems. The burning question then becomes how to do it.

Connectors . . . The relative position of aluminum and copper in the electromotive force series of the elements makes it essential that precautions be taken to avoid electrolytic or galvanic corrosion in connections between these two metals.

Aluminum and copper have an electrode potential difference of approximately two volts. Copper in contact with aluminum causes a current to flow from the aluminum through the electrolyte to the copper. Thus, the aluminum is rapidly attacked, and the copper is protected. The reaction rate is increased with increasing temperature.

Special aluminum connectors with copper inserts are available for aluminum-to-copper connections. When these inserts are in intimate contact with the aluminum there are no voids to hold the electrolyte. Consequently electrolytic action is eliminated. Bimetallic washers or inserts are also used in some types of clamps and connectors. Bronze connectors with plated coatings of tin, zinc or lead are also available as universal connectors for use on either aluminum or copper or both.

Primary Circuits . . . of the Consumers Power Co system are built with bare conductors. ACSR is used for urban and rural long-span construc-

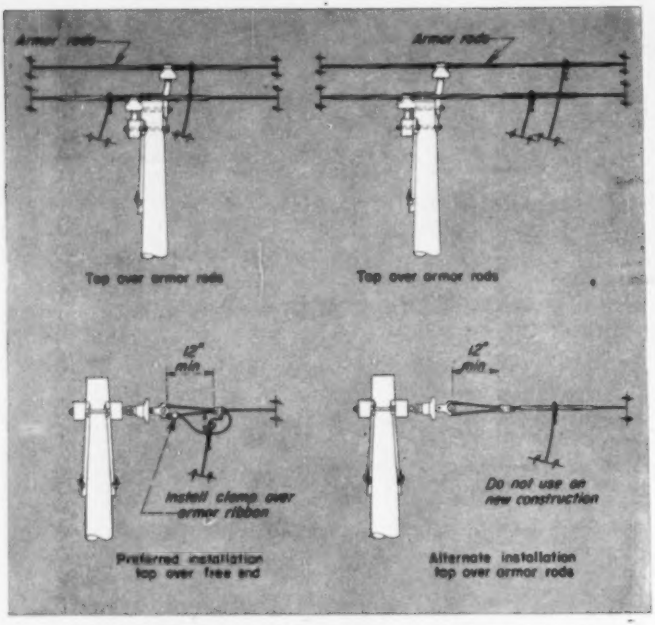


FIG 3—HOT LINE CLAMPS are installed over armor rods and where tap is beyond rods at point of support, half length rods are installed to accommodate clamps. Conductors and clamps are cleaned thoroughly and No-Ox-Id A is applied to surfaces before installation

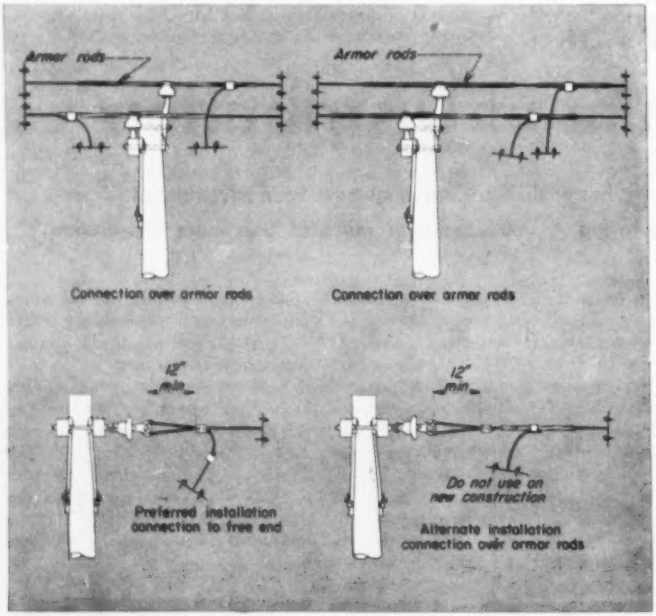


FIG 4—CONNECTIONS are made with parallel groove clamps over armor rods. Either straight or preformed armor rods are used to protect ACSR conductors. Conductors and clamps are cleaned and painted with No-ox-id A

tion and for short-span construction where economic advantages can be realized. Where corrosive atmospheres are prevalent the conductor best suited to the existing condition is selected. ACSR conductors should not be used in areas where the aluminum or steel strands are subjected to excessive contamination.

No. 4, 2 and 1/0 ACSR conductors have been installed as rural primaries in spans of 350 to 400 ft since 1929. Urban primaries of ACSR with span lengths of 300 to 500 ft have been installed since 1946. In many instances such spans involve only one pole per city block, with intermediate shorter poles for distribution secondaries, Known as "skip-span" construction this type of installation has been used with high strength composite copper conductors since 1941.

Construction standards for bare ACSR primaries have been well established. Conductor ties to pin-type insulators are made in accordance with manufacturer recommendations. If for some reason weatherproof primary is installed or retied, the covering under the tie wire should be completely removed and bare tie wire installed to prevent radio interference. Pull-off and T-tap ties, Fig 1, are made in the same manner as for other types of conductors. Dead-end pull-off and T-tap assemblies are constructed as shown in Fig 2.

No. 7 aluminum alloy tie wire has been used for all sizes up to and including 1/0 ACSR. No. 6 aluminum tie wire is now recommended for these sizes as it is somewhat softer and can be served more tightly around the conductor. No. 4 aluminum tie wire is used for all sizes larger than 1/0.

Hot line clamps and parallel groove clamps used on aluminum or ACSR conductors have cast aluminum bodies. If a copper tap is installed, the hot line clamp or parallel groove clamp designed for bimetallic connections must be used. Hot line clamps and parallel groove clamps are installed over armor rods, Fig 3 and 4.

Armor rods are installed to protect ACSR conductors at all pin type insulator and pull-off corner supports, as well as at all hot line clamp and parallel groove clamp installations. Either straight or preformed armor rods are used. Preformed armor rods, one-half the length used for single ties, are installed for hot line and parallel groove clamp connections when these connections cannot be

made over the armor rods at the supports. Weathered or oxidized cable should be cleaned with a wire brush, emery cloth, or other suitable means before installing armor rods.

Splices and joints in ACSR primaries are made with oval twisting sleeves using two sleeves per joint, Fig 5. Before making a joint, the inside of the sleeve and ends of the cable to be inserted in the sleeve must be perfectly clean and free from dirt and grease. A wire brush should be used to remove oxide from weathered cable. No-Ox-Id, or other grease type compounds, **should not be used** on cable to be inserted **in the sleeve** because it acts as a lubricant and will reduce the holding power of the joint.

Secondary Circuits . . . Until recently copper conductors have been used in the secondary circuits. Now, however, secondary lines are using No. 4 and No. 2, 6 x 1, ACSR with weather-resistant coverings as substitutes for No. 6 and No. 3 double braid weatherproof copper. Secondary spans in urban areas are maintained at 200 ft maximum. This is the standard practice with copper conductors. Average urban span length is approximately 150 ft. Stringing sags for ACSR secondary conductors are the same as those for copper secondary conductors. Final sag values for the No. 4 and No. 2 ACSR secondaries are considered as being the same as those for No. 6 and No. 3 copper respectively. Stringing sags for No. 2 ACSR in rural areas are the same as used for No. 3 copper with a maximum span length of 210 ft and final sags are considered as being the same as those for No. 3 copper.

Guying tensions for the ACSR secondary conductors are considered to be the same as those required for the equivalent copper conductors. Construction standards for secondary supports, secondary configurations and

CONCLUSION ABOUT ALUMINUM FOR DISTRIBUTION . . .

Based on experience of Consumers Power and other utilities

1. The use of bare ACSR instead of bare copper results in a substantial saving.

2. ACSR with weather-resistant covering can be installed in secondary circuits at approximately the same cost as the equivalent weatherproof copper conductors.

3. ACSR with weather-resistant coverings is somewhat more expensive for service installations than the equivalent copper conductors because of the additional connector cost. A 75 to 80-ft service would cost approximately 25% more.

4. All-aluminum conductors with weather-resistant coverings in sizes of No. 2 and larger can be installed in secondaries and services at a lower cost than the equivalent copper.

5. Self-supporting aluminum conductor with bare ACSR messenger, "Triplex," appears to have definite advantages over other types of services both from a cost standpoint and in the general appearance of the installation.

6. Additional savings in the use of ACSR or all aluminum conductors for secondaries and services can be realized by using plated universal type connectors and by attaching the services to the secondary racks.

The application of aluminum to overhead distribution systems presents no difficult problems, and it is fortunate that such a material is available for the expansion programs now confronting the electric utilities of the country.

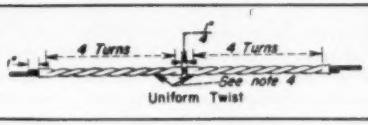


FIG 5—SPLICES AND JOINTS are made with two twisting sleeves per joint

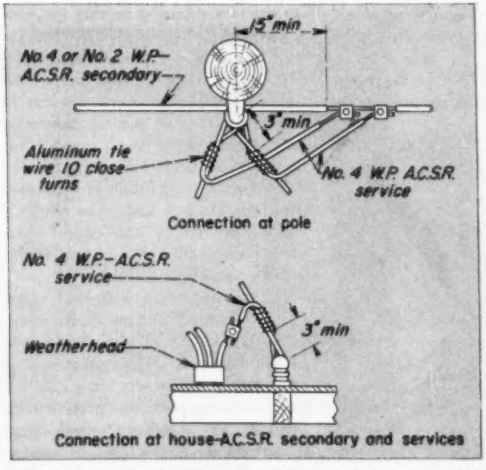


FIG 6—ACSR SERVICE AND SECONDARY conductors are supported by same rack and ACSR service conductors are dead ended at pole and building with 10 turns of aluminum tie wire over covering

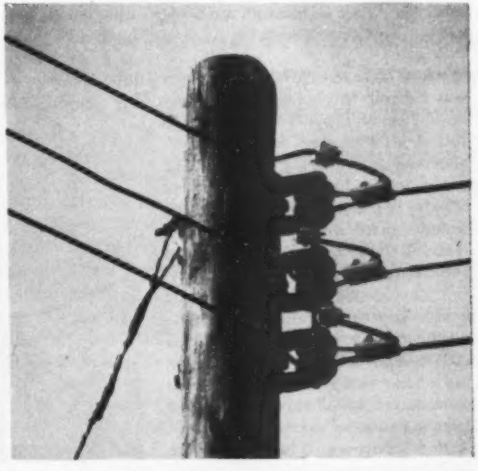


FIG 7—ACSR SERVICE to ACSR secondary connections are made with proper aluminum to aluminum connectors. One connector is used for each service connected to the secondary

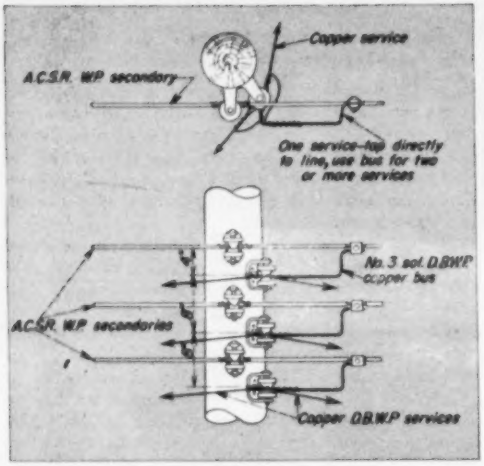

Copper service
A.C.S.R. W.P secondary
One service—tap directly to line, use bus for two or more services
No. 3 sol. D.B.W.P. copper bus
A.C.S.R. W.P secondaries
Copper D.B.W.P services

FIG 8—ADDITIONAL RACK AND SPOOL insulator are required where copper service is connected to ACSR secondary

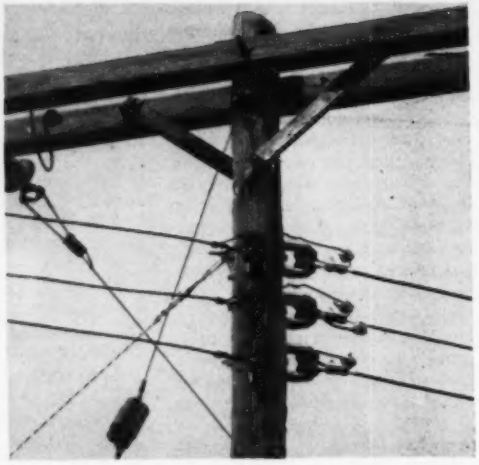


FIG 9—COPPER SERVICE TO ACSR secondary connection is made with copper to aluminum connector

line angle construction for No. 4 and No. 2 ACSR are the same as those applying to No. 6 and No. 3 copper.

Secondary connections and attachments for ACSR conductors are similar to those used in the past for copper conductors. Secondary configurations for aluminum are also similar to those for copper conductors. For ACSR dead ends a parallel groove clamp is installed instead of the wire rope clip used with copper conductors. A section of the covering is removed so that the parallel groove clamp is attached to the bare conductor. For ties, bare aluminum tie wire is used over the conductor covering. Tension splices in ACSR secondaries are made with two twisting sleeves, Fig 5.

Services . . . In 1947, when copper was difficult to obtain, the company bought about 120,000 lb of No. 3 7-strand, all-aluminum conductor, with neoprene covering, for services. The use of this conductor was discontinued mainly because of the dead-end tie which utilized most of the available space on the secondary rack spool and because of the greater sag necessary.

Today's conditions have again made it necessary to supplement the copper conductor for service installations. ACSR with weather-resistant covering is being used as a substitute. These services are installed with the same stringing sag as equivalent copper. A 70-ft service would be installed with two feet of sag. To guard against electrolytic corrosion, ACSR and copper conductors have been supported by separate rack insulators when used in combination, even though the respective kinds of conductors were covered with braid or other weather-resistant materials. This practice is being discontinued and single rack construction for this purpose will be used in the future.

ACSR service and secondary conductors are supported by the same rack spool insulator and the ACSR service conductor is dead-ended at the pole or the building by serving ten close turns of bare aluminum tie wire over the conductor covering, Fig 6. Connection of ACSR service conductor to the ACSR secondary is made with the proper aluminum to aluminum connector, one connector to be used for each service connected to the secondary, Fig 7. At the building, the connection is made with the proper aluminum to copper connector.

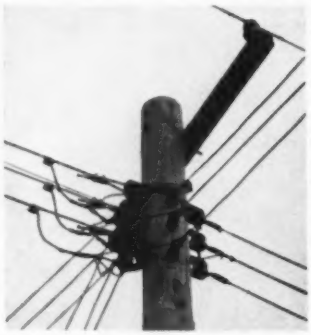
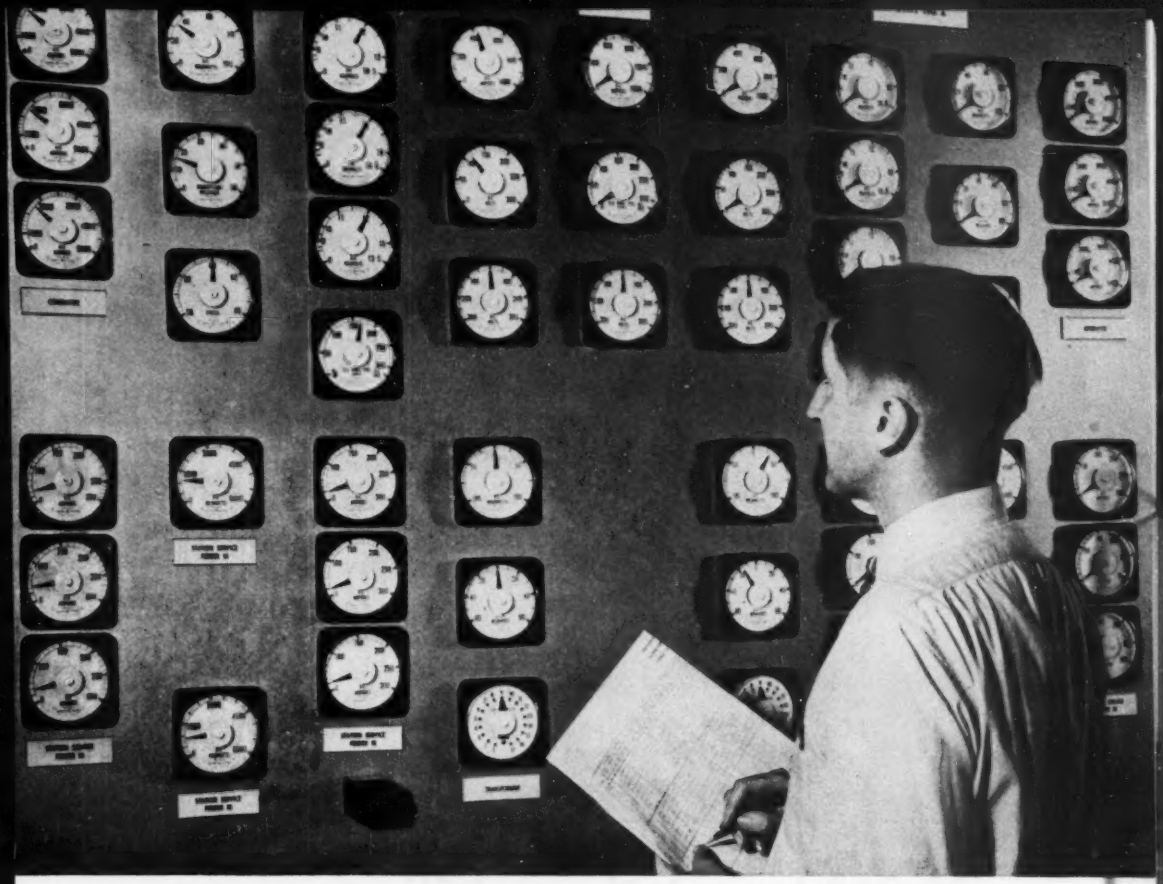


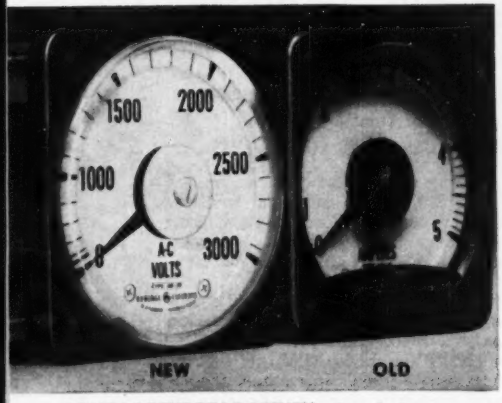
FIG 10—ALUMINUM TO COPPER connections are kept to minimum when two or more services are installed

Early standards for copper service conductor connected to an ACSR secondary, Fig 8, required an additional rack and spool insulator for the service conductor. This practice has been discontinued. Copper services are connected to the ACSR secondary as shown in Fig 9. To keep the number of aluminum to copper connections to a minimum when two or more copper services are installed a No. 3 solid copper bus is tied to the service rack spool and connected to the ACSR secondary conductor with proper aluminum to copper connector, Fig 10. Copper service conductors are connected to the bus by serving the service conductor, a practice used in the past for connecting copper service conductors to copper secondary. Although ACSR service connections to copper secondaries are recommended only when copper service conductor is not available, when required, the ACSR service conductor is supported by a separate rack and spool insulator and connected to the copper secondary conductor by a proper aluminum to copper connector.

A self-supporting aluminum conductor, "Triplex," is now available for services. It consists of one No. 6 bare ACSR, which is used as the neutral and supporting conductor, and two No. 4 neoprene or polyethylene covered all aluminum conductors. Studies indicate that this conductor can be installed at a lower cost than three single No. 6 copper conductors with weather-resistant coverings.



See How Easily You Can Read These Instruments



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That's why Delaware Power & Light recommended new General Electric shadow-proof instruments

When Delaware Power and Light built its new Edgemoor Generating Station, the company specified G-E shadow-proof instruments for the control room. They indicate performance of two generators, excitors, amplidynes, and transformers.

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You can obtain shadow-proof instruments in both 4¼- and 8¾-inch sizes as ammeters, voltmeters, and wattmeters; frequency and power-factor meters; temperature indicators and synchroscopes.

Specify G-E shadow-proof instruments for your control stations, testing devices, and other installations. Ask your G-E representative for more information or write Section 602-211 for Bulletin GEC-218B. General Electric, Schenectady 5, N. Y.

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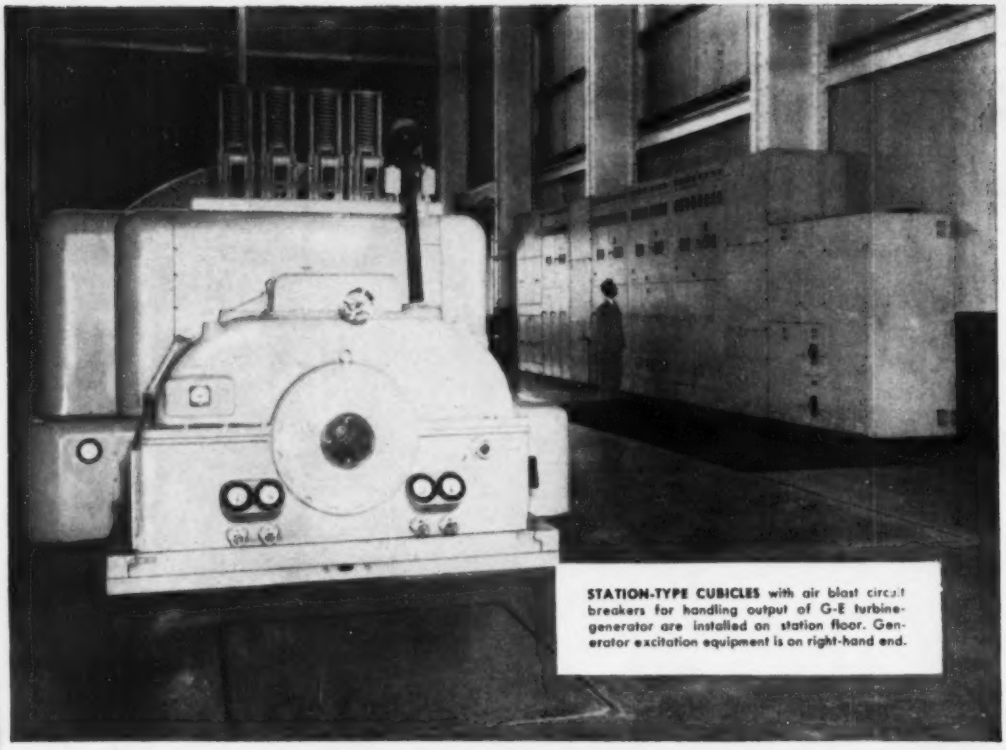
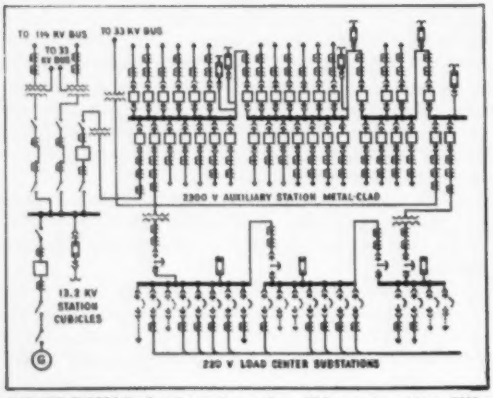
602-211



STATION-TYPE CUBICLES with air blast circuit breakers for handling output of G-E turbine-generator are installed on station floor. Generator excitation equipment is on right-hand end.

60,000-kw station addition uses completely factory-assembled equipment


TO 132 KV BUS
TO 33 KV BUS
TO 33 KV BUS
2300 V AUXILIARY STATION METAL-CLAD
13.2 KV STATION CUBICLES
220 V LOAD CENTER SUBSTATIONS

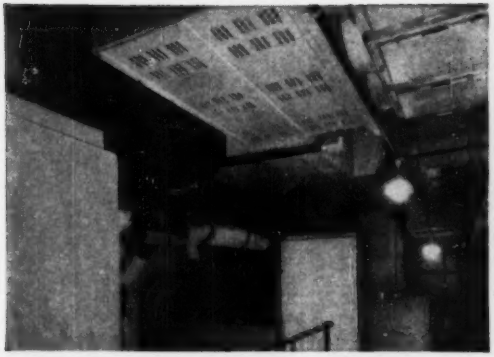
ONE LINE DIAGRAM of station equipment shows 13.2-kv station cubicles, 2300-v metal-clad switchgear and 220-v station auxiliary load-center unit substations.

Planned as a Project from Generator to Power Transformer with G-E METAL-ENCLOSED COMPONENTS

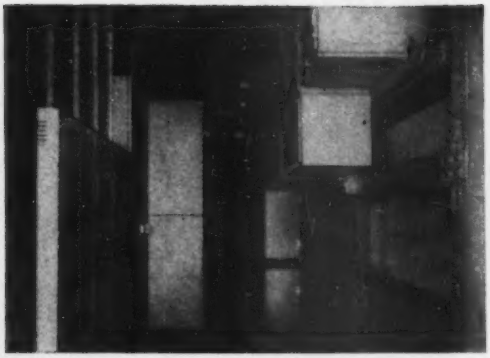
An outstanding example of compact, unified design, this 60,000-kw addition to New Jersey Power & Light Company's Gilbert Station illustrates the many advantages of complete station project planning with G-E standardized equipments.

All major units of the plant electrical equipment were supplied as a factory-assembled "package," ready to install. Station engineering was greatly simplified. "On the job" assembly was reduced to a minimum. And complete metal enclosure of all components assures maximum safety and dependability.

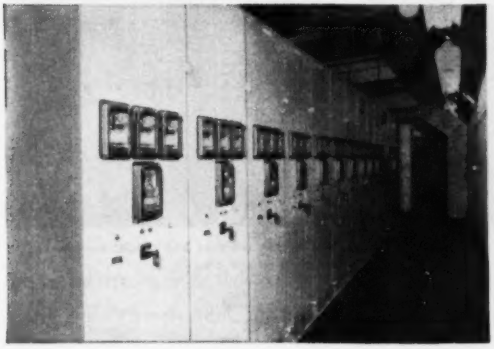
For complete information on G-E station-type equipments, see your local G-E sales representative or write to *General Electric Company, Schenectady 5, N. Y.*



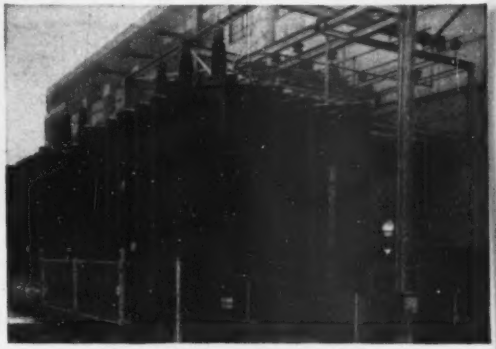
METAL-ENCLOSED ISOLATED-PHASE BUS conducts power from generator to switchgear cubicles and from cubicles to power transformer bank. Close coupling between generator and cubicles saves copper. Factory assembled units were easy to install.



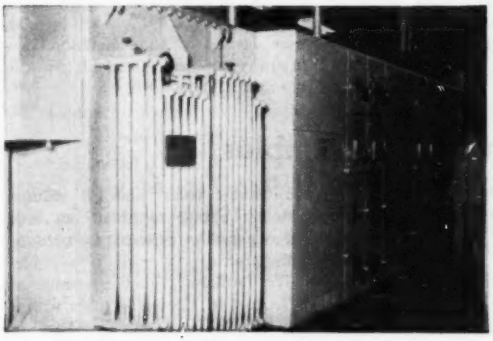
BACK VIEW—STATION CUBICLE SWITCHGEAR AND EXCITER BOARD, showing isolated-phase bus to outdoor power transformers. Metal-enclosed construction gives complete protection. Hinged covers removable for inspection.



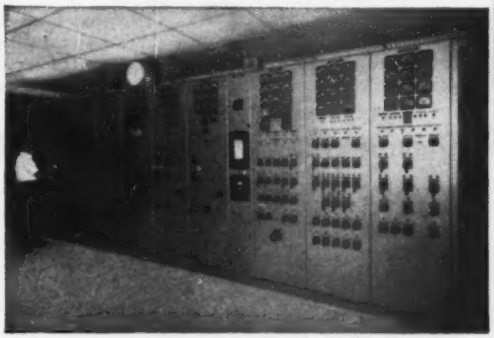
METAL-CLAD SWITCHGEAR with magne-blast power circuit breaker for station service. Shipped ready to install, complete with circuit breakers, interconnections, busses and interlocks—all in one package.



ISOLATED-PHASE BUS TO POWER TRANSFORMERS with throat-connected seal-off bushings are used at building wall to provide a weather-tight seal. Factory assembled units ensure ease of installation and provide maximum protection.



LOAD-CENTER UNIT for low voltage service. Entire assembly ordered and shipped as a factory-co-ordinated unit, ready to install. Air circuit breakers are draw-out type for easy testing and inspection.



METAL-ENCLOSED DUPLEX CONTROL BOARD provides centralized control and metering. Control and indicating equipment is mounted on front panels and recording, regulating and protective equipment on rear.

GENERAL ELECTRIC

#55-30

REMOVING HOT CONDUCTORS to special rack facilitates crossarm replacement. Rings on special crossarm speed the work when using hot line tools. Old crossarm is then replaced and conductors returned to position and tied to insulators on new arm

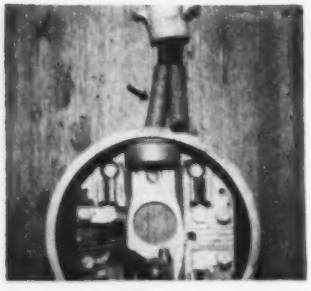
Special Crossarm Speeds Changes on Hot Line

The time required for crossarm replacements on hot lines has been reduced by 60% in the Texas Electric Co's Big Spring District. Use of a short gin pole with a special cross arm of two 1-in. by 4-in. boards having hooks in various positions on the arm has effected this saving.

The gin pole is clamped near the top of the line pole, and the energized conductors are lifted to the special arm by hot sticks. With the conductors lifted clear, the old crossarm is replaced quickly and easily. Again using hot sticks, the conductors are transferred from the hooks to the new crossarm and tied to the insulators. The gin and special crossarm are then removed from the line pole and the job completed.

Equipment for this job, and method, were devised by John Garrison, Distribution Foremen, Texas Electric Co, Big Spring, Texas.

Disconnect Live Meter With Insulated Thimbles



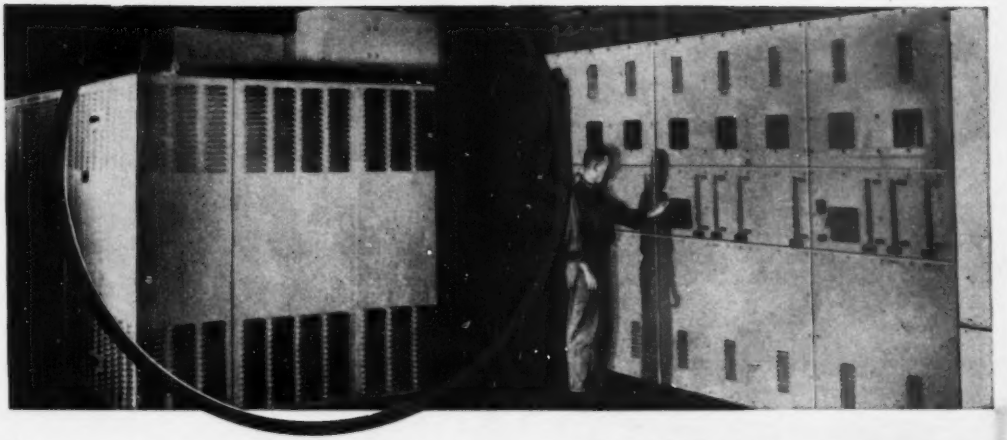
INSULATED THIMBLES (arrow) permit safe removal of live service cable from base of socket-type meter or from service boxes

MILO W. HILL
Serviceman
Indiana & Michigan Electric Co
Elkhart, Ind.

Service-entrance cable now can be removed safely from socket-meter bases or service boxes by using insulating thimbles at the bare ends of the cable. In addition, use of the thimbles (1) eliminates disconnecting of the service at the pole; (2) simplifies replacement or repair of damaged meter sockets or boxes so that it can be done without flash hazard and may be completed on first trip; (3) saves considerable labor; and (4) reduces customer outage to about one half that required by customary procedure in the past.

The insulating thimbles consist of ⅜ in. x 2 in. fiber plug tubes with a plug inserted in one end. They fit snugly over the conductor. They cost about 10 cents per pair.

In operation, one service conductor at a time is disconnected and a thimble slid over its bare end. After both live conductors are thus insulated, the bushing is detached from the base and the service cable may be withdrawn easily and safely.



G-E metal-enclosed reactors match modern G-E metal-clad switchgear in appearance—are usually built of special nonmagnetic steels or with panels divided into insulated sections, to hold down circulating current and keep losses and heating to the minimum.

Install your reactors adjacent to your switchgear

Metal enclosures, with their increased safety and good appearance, make this practical—save space and shorten bus runs.

With modern, good-looking metal enclosures, reactors can now often be installed alongside or as part of metal-clad switchgear. Savings in metal-enclosed buses, in space, and perhaps even in the cost of running buses to another floor for the reactors may well pay for the enclosures. In addition to increased safety to personnel, you also protect the reactors from external damage and limit the magnetic field.

General Electric metal-enclosed reactors can be built to match your switchgear. Housings are so designed as to keep down circulating current, losses and heating. G-E reactors themselves are of time-proved, one-piece, cast-in-concrete design—with such recently announced improvements as glass insulation and continually transposed conductors.

For full information on G-E cast-in-concrete reactors and their applications, and on metal enclosures, get in touch with the nearest G-E Apparatus Sales Office. *General Electric Company, Schenectady 5, New York.*

Among the extras that you'll find in G-E metal enclosures for reactors are these built-in supports for the leads.

GENERAL ELECTRIC

SPIRAKORE® TRANSFORMERS

GIVE EXTRA YEARS OF SERVICE

Soaked in the flood...

"We cleaned and tested the first few of the newer transformers," said city engineer, Harvey Earp, "and found that no water had gotten in, ...

"so we just hosed down the remaining Nitrile-sealed transformers, gave them a routine check, and put them back on the lines."

G-E Spirakore* Transformers stay moisture proof!

When the flood hit the city of Osawatomie, Kansas, it completely submerged a number of distribution transformers. Yet service was restored in most areas only a few hours after the water receded.

This speed was possible because of the fine work done by the repair crews . . . *and the water-tight seal on G-E Spirakore transformers.* Although water did leak into some transformers of older design, every one of the Nitrile-sealed Spirakore transformers came through unharmed. The first Nitrile-sealed transformers recovered were cleaned and found undamaged—so the rest were merely washed with a hose, given a routine inspection, and put back in service without an inside tank check. And they are still on the job!

Nitrile Gaskets Used in Every Opening! Not even flood waters could get into Spirakore transformers because every opening—for cover, hand-hole and bushings—gets sealed with a Nitrile gasket. Completely air-tight, water-tight, this sealing eliminates transformer breathing—prolongs the life of both oil and insulation. Because no cement or sticker is used, gaskets can be removed easily—are reusable.

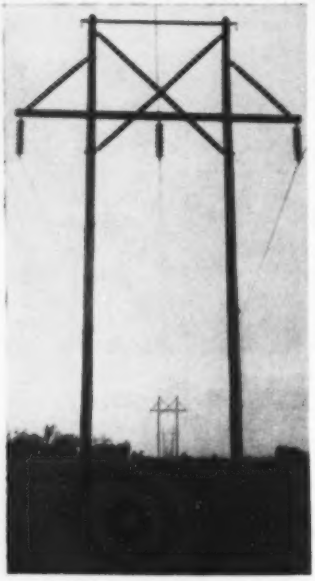
Better sealing is just one of the design features that make Spirakore the finest transformer obtainable. Bulletin GEA-5400 describes many more. If you haven't a copy, write for one today. Address *General Electric Co., Schenectady 5, N. Y.*

*Reg. *Trade-mark of General Electric Co.*

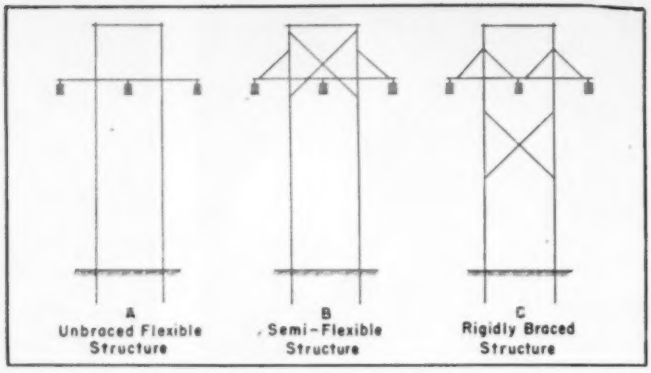
"The Nitrile seal," continued the city engineer, "kept our Spirakore transformers air-tight and helped us get our system back in service just a few hours later."

402-117

GENERAL ELECTRIC



SEMI-FLEXIBLE STRUCTURE holds alignment under all conditions; cuts building costs



STRENGTH COMPARISONS for H-frame designs are based on 60-ft Class 3 fir poles; 336,400-cir mil ACSR; ⅜-in. galvanized HS steel ground wires; 750-ft spans; heavy loading conditions

Design	Pole Bending At Ground Line		Maximum Horizontal Earth Pressure	Downthrust
	Foot-pounds	F. S.	Tons Per Square Feet	Pounds
A	89,000	3.38	13.1	5,056
B	57,000	5.30	7.9	7,266
C	27,000	11.13	4.5	9,326

Semi-Flexibility Reduces Downthrust in H-Frame

L. H. KINGSTON
Transmission Engineer
Wisconsin Public Service Corp
Green Bay, Wis.

By permitting some bending in H-frame transmission structures, earth pressure due to vertical thrust is reduced. This semi-flexibility is accomplished by raising the X-braces to the top of the structure between the shield wires and the conductors.

This design is used as a compromise by Wisconsin Public Service Co between the unbraced flexible structure in which horizontal earth pressure is critical and the rigidly braced structure in which downthrust is critical. Downthrust may cause structural displacement in certain types of soil during wet seasons. Therefore, downthrust shoes are sometimes used.

The company has used this type of structure for six years and finds it adaptable to the terrain in their territory. It is designed for fairly level farm-dairy country where span lengths average 600 ft. Use of long-span X-braced structures with knee braces and K-braced dual plank crossarms would give an overdesigned and uneconomical line.

Other features of this type of line are:

1. A metal shield wire crossarm which connects the two shield wires electrically at the top of the pole and reduces stresses in the X-braces.

2. Knee braces which support two sections of the crossarm in cantilever and prevent the conductor from falling in case of a broken arm.

3. Single arm located inside the X-brace section which acts as a simple conductor support and receives no stresses because of bending in the structure.

4. Pole bands at the bottom of the X-brace, where stress is a maximum, eliminate weakening effect of drilling through the pole.

5. Easier initial stringing of conductors and lowering of conductors due to elevated postion of X-brace.

Use of this simplified H-frame design has reduced construction costs by a considerable amount.

Basic Requirements for Station P-A Systems—II

S. C. BARTLETT
Electronics and Communications Section
American Gas and Electric Service Corp
New York, N. Y.

Here are presented equipment requirements as a supplement to operating requirements (EW, Jan. 28, 1952, page 178) for public address systems in power stations.

Speakers—In the production sections, we prefer speakers with straight trumpets or re-entrant horns of the smallest type manufactured; specifications for these speakers include 12-in. diameter bells with a 40-deg spread at 1,000 cycles; 2.5 to 3.5-ft air columns, and permanent magnet 25-w driver units which are resistant to humidity, temperature, vibration and dirt.

In control rooms a 5-in. cone type speaker mounted in one of the panels provides adequate volume and quality.

GENERAL ELECTRIC COMPANY

TRANSFORMER AND ALLIED PRODUCTS DEPARTMENT

100 WOODLAWN AVENUE, PITTSFIELD, MASS . . . . . TELEPHONE 8211

December 3, 1951

SUBJECT: New ASA Recommended Standards for Transformers

MEMORANDUM: To all G-E Transformer Specialists and readers of Electrical World

The transformer standards recommended by the American Standards Association (C-57 Sub-committee, 1st report - 6th draft) do not materially affect the policies of this department.

We achieved the first effective standardization of power transformers in 1944 when we introduced our Repetitive-Manufacture line. The new recommended standards are, in a sense, a realization of these early efforts.

The kva ratings, voltage ratings and most accessories approved as standard by ASA have been available for some time as part of General Electric's "RM" line. Some minor modifications in base construction and location of accessories will be necessary for complete conformance with ASA Standards.

Customers desiring ASA standard transformers may order immediately. The necessary modifications will be made at the time of manufacture. Delivery and price advantages will be the same as those for present RM transformers.

W. S. Ginn

W. S. GINN
Manager of Sales
Transformer & Allied Products Dept.

401-27A

In office areas the sloping-panel type speaker mounted near the ceiling is desirable if many persons are to hear the speaker. If only one person in the office is concerned, a small desk-type speaker is most satisfactory (see illustration).

Microphones—Any modern microphone gives adequate sound fidelity, but the crystal types are avoided in this service because of their fragility and damage by temperature and humidity. We favor conventional carbon microphones, preferably in the form of telephone handsets, because of their ruggedness, low cost and general availability. For high-noise areas, soundproof booths equipped with conventional monophones are desirable.

Tubes—Wide choice of tubes to produce adequate fidelity is afforded by either tetrodes or triodes, but we prefer the latter because of their stable characteristics. Conventional receiving tubes are used in the input and driver stages of the public-address systems. For the final stages, such types as 211, 805, 811, 835, 845 may be employed.

SMALL SPEAKER of the desk-type is suitable for contacting only one person in area where many persons are normally employed

Amplifiers—For convenience and simplicity, we prefer mounting all equipment in a cabinet containing microphone supply, local speaker and monophone panel, control chassis, main amplifiers and terminal boards. The amplifier should be located in the enclosure provided for the telephone switchboard, carrier-current equipment, or other electronic equipment. Otherwise it should be located in the control room, an office, or where the ambient temperature does not exceed 90 F, and where excessive vibration and spatter of liquids are not normally present.

Cables—Plant cable stocks for which fittings are immediately available should preferably be used. Microphone and speaker leads should be run in separate conduits, where possible, but microphone circuits can be in the same conduits with other signal circuits.

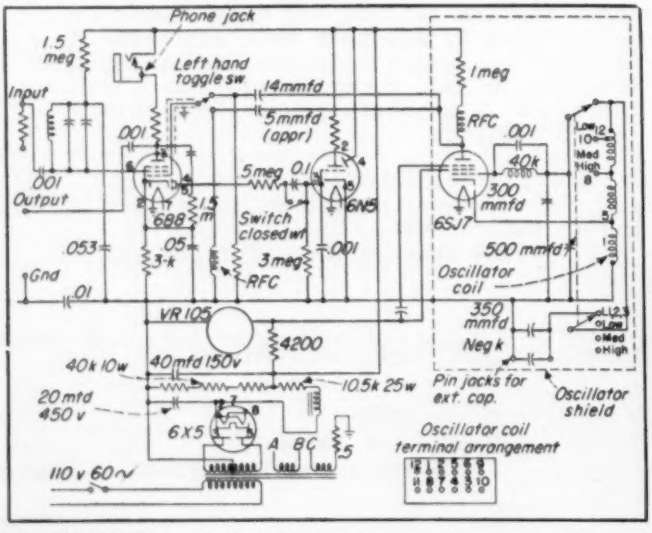
Carrier Frequency Monitor Proves Very Useful

H. J. SUTTON
Engineer
Gulf States Utilities Co
Beaumont, Texas

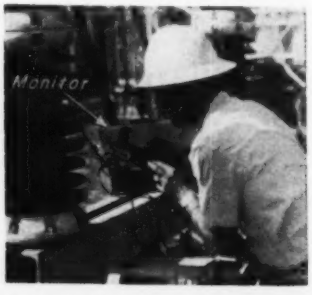
Design of a special carrier current frequency monitor which has proved very useful was developed by E. C. Sawyer, relay engineer. This monitor is used to set the carrier frequency of transmitters and the resonant frequency of wave traps. It also drives a resistance-coupled amplifier. Output of the amplifier may then be used in tuning receivers and as a source of variable frequency power for running frequency attenuation curves on a transmission line which is tapped by one or more feeder lines.

The monitor incorporates: (1) A stable oscillograph with a dial unit in steps from 0 to 500 on the variable capacitor; (2) a built-in electric eye that provides a null frequency indication when checking the frequency of a transmitter, and an indication for checking resonant frequency of carrier wave traps; and (3) a built-in receiver for checking the oscillator frequency against a local broadcasting station.

It is compact as shown in the illustration. Calibration sheets used in conjunction with the unit provide a quick means of determining frequency from the dial reading.



MONITOR CIRCUIT was developed for testing frequency of transmitters and resonant frequency of wave traps. The monitor also drives a resistance-coupled amplifier



COMPACTNESS is a feature of the carrier frequency monitor unit

a modern version of an old standby — DELTA-STAR'S

New "PMK"

Here is an old friend you have long been familiar with for substation and pole-top application. It now incorporates all the modern, trouble-free features which have proved so successful on other DELTA-STAR Switches.

Large, hard drawn copper contact shoes, with oval shaped silver inlays, operate against the hard drawn copper tubular blade to form a high pressure small area contact—assuring superior electrical and thermal characteristics.

Years of wear on the contacts and blade will cause no appreciable reduction in contact pressure because of the long multiple leaf pressure applying springs of fatigue resistant beryllium copper. These springs do not function as current carrying members.

Offset arrangement of contacts combined with the blade motion develops a twisting shear, easily breaking formations of ice and corrosion.

These features **plus** all the well-known standard features demanded by engineers, a minimum number of insulators per single pole element, one contact, tubular blades, free swinging bronze ball bearing terminals, minimum side and overhead clearance, and simple mechanism.

Available in "PMK-22" the two bearing type and "PMK-23" the three bearing type, for upright or inverted mounting in all standard voltage ratings from 7.5 to 161 kv at 400, 600 and 1200 amperes.

CONSULT THE FACTORY OR OUR NEAREST DISTRICT OFFICE FOR COMPLETE INFORMATION

DELTA-STAR ELECTRIC COMPANY

DIVISION OF H. K. PORTER COMPANY, INC.

2437 Fulton Street • Chicago 12, Illinois

DISTRICT OFFICES IN PRINCIPAL CITIES

Westinghouse Switchboard Instruments are used as "standards" on this Universal Tube Test Station manufactured by Radio Corporation of America.

Westinghouse Switchboard Instruments are available in circular or conventional scale types for any switchboard application.

Where instrument accuracy is a "Must"... specify Westinghouse

The use of Westinghouse instruments as "standards" on RCA's Master Tube Test Stations demonstrates how they measure up to *your* need for accurate measurement of any electrical quantity.

In order to reliably measure the quality of all types of electronic tubes the instruments have to consistently maintain precise accuracy. Westinghouse Switchboard Instruments not only fulfill this requirement but provide important plus benefits as well: Easier readability—to simplify the operator's job . . . and co-ordinated space-saving design—to contribute to the functional compactness of the unit.

Here's further assurance of quality: all Westinghouse switchboard panel, portable and recording instruments are built to meet the rigid performance requirements of the American Standards Association. Moreover, you can select from . . .

The most complete line in the industry!

You get a wider selection for every need whether it be a-c or d-c current and voltage, single or polyphase circuits, watts or vars, frequency, power factor, synchroscopes, temperature indicators, ground detectors or synchrotie (position indicators). And you get . . .

Competent application assistance!

Westinghouse Instrument Application Engineers are available to consult with and serve you in selecting and applying the proper instruments for your application. Simply call your nearest Westinghouse office.

For complete information about Westinghouse Instruments write for Booklet B-4696. Address: Westinghouse Electric Corporation, P.O. Box No. 868, Pittsburgh 30, Pennsylvania. J-40400

YOU CAN BE SURE... IF IT'S Westinghouse

INSTRUMENTS

Lignite Properties and Application Data

Data based on experience with spreader-stoker fired and pulverized-coal fired boilers at seven electric utility stations and one industrial plant in the North-Central states

JOHN M. DRABELLE
Consulting Engineer, Cedar Rapids, Ia.

1. Structure—Lignite coal has a woody texture, has a brown color, and contains considerable moisture.

2. Proximate Analysis—A typical analysis is given in Table I.

3. Moisture Content—Range 25 to 40%, average 35%; varies with mine, weather and storage.

4. Ash—Residue from either spreader stoker or pulverized fuel fired boilers is a heavy fine sand-like material, highly abrasive.

5. Volume of lignite coal for the same Btu of bituminous coal handled by conveyors, bunkers, coal scales and hopper pipe is a factor of about 2.

6. Weight—Lignite coal in the "solid" at the mine face weighs about 90 lb per cu ft; as screenings as received in cars, about 45 to 50 lb per cu ft.

7. Storage—Best practice to date, according to developments by U. S. Bureau of Mines at Fargo, N. D., are piles built in 1-ft thick layers, bulldozed and rolled. Piles are formed to 6-8 ft high.

8. Fires—Although low in sulphur, lignite ignites readily in storage pile. In North Dakota piles are shielded from northwest winds to prevent firing on windward side. A clamshell-unloaded pile not compacted in the summer months will fire in about 60 days.

9. Cold Weather—At —15 to —40 F flow difficulty or "hang-ups" is experienced in bunkers, spouts, scales and hoppers due to moisture evaporation and the coal going to a "mush" like consistency. Hang-ups are caused also by restrictions such as bunker coal valve and sharp angle turns. To overcome hang-ups, gunite lined coal bunkers have been found to give less trouble. Preheated air has been blown into bunkers but without much success.

10. Spreader Stoker Firing—This firing method predominates in all lignite-using central station and sugar refinery plants in Minnesota, North Dakota and South Dakota. Preheated air and continuous ash discharge traveling grate are employed. This grate is preferred to dump type of grate because of the cleanliness factor in its present state of development for lignite coal firing.

Characteristics of spreader stoker fired boilers are listed in Table II.

11. Pulverized Lignite Firing—This firing method is used in one central station in the region surveyed. High power is required for grinding lignite due to fact that approximately twice the tonnage must be ground for the same number of required Btu as compared to that of eastern coals. Fibrous nature of some of coal also increases the difficulty in grinding and consequent power required. Approximately 60% through a 200-mesh screen is the amount a mill will grind with new hammers.

12. Steam Dried Lignite—U. S. Bureau of Mines is experimenting to produce a product known as "steam dried lignite."

13. Slagging—Very little slagging difficulty is encountered in the boilers. Preferred furnace is one having a height from grate surface to roof of approximately two times the furnace depth.

14. Flyash—Large quantities of a very fine flyash material accompanies the furnace gas stream, owing to the high fusion point of the ash. Dust deposits are troublesome and proper soot blowing equipment must be provided for their removal throughout the entire gas pass system of the boiler, convection, superheater, economizer and air preheater.

15. Boiler Size—Boilers with ratings from 60,000 to 180,000 lb per hr are in use. Operating personnel believe that 210,000 to 240,000 lb per hr boilers represent the limit of the spreader stoker in its present state of development for lignite coal firing.

The throw and distribution of lignite is limited practically to 18 to 19 ft furnace depth, effective grate surface. Width of furnace is a result based on the pounds of steam generated per foot of furnace width, and the Btu released per square foot per hour of grate area.

16. Coal Cost—Lignite coal costs approximately $1.80 to $2.20 per ton, fob cars at the mine, with freight rates to destination varying from $2 to $3.50 per ton, plus federal taxes.

Table I—Typical Proximate Analysis of Lignite Coal
(Basis, as received, as classed by power station operators)

Item	Good	Average	Poor
Moisture, %	36.3	40.3	35.3
Volatile Matter, %	28.96	25.30	31.94
Fixed Carbon, %	28.13	27.80	23.91
Sulphur, %	0.80	0.67	1.12
Ash, %	6.5	6.47	8.7
Btu per lb	6,700	6,220	5,990

Notes: Ash fusion temperature softening, ASTM: approximately 2,050 F. Sulphur (Pyritic) is in the form of small balls about BB shot size.

Table II—Predominating Characteristics of Spreader-Stoker Fired Boilers

a. Boiler ratings: 60,000 lb to 180,000 lb/hr.
b. Underthrow stoker gives best distribution and burning pattern.
c. Continuous ash, front discharge grate.
d. Combustion rate: 60 to 70 lb/sq ft/hr.
e. Air preheat temperature: 300 to 340 F.
f. Ash depth on stoker chain: 5 to 6 in.
g. Over fired air and furnace turbulence essential.
h. Cinder return to furnace from boiler pass hoppers only.
i. Flyash from economizer: Air preheater and dust collector to station ash tank.
j. Air openings in chain grate should not exceed 7% of grate gross area.
k. Boiler outages for gas passage and furnace cleaning are at about 6 month intervals. Some piling up of very fine dust air heater header plates. Sodium sulphate deposits on fire side of superheater, water walls, economizers and air preheater tubes are encountered.
l. Induced draft fans are installed at outlet of dust collector which is after the economizer and air preheater. This practice avoids fan erosion due to highly abrasive dust.

Table III—Operating Data for Stoker And Pulverized Lignite Fired Boilers

Item	Boiler No. 1	Boiler No. 2
Manufacturer	Riley	Riley
Firing	Stoker	Pul. Lignite
Normal Steam Rate, lb/hr	60,000	60,000
Max. Steam Rate, lb/hr	80,000	80,000
Stoker	Riley Spreader	.....
Stoker Feeders	3	.....
Mills	.....	2
Burners	.....	4
Ash	Cont. Discharge	Dry Bottom
Operating Power		
Chain Grate Drive	1— 1 hp	.....
Spreader Drive	1— 3 hp	.....
Overfire Air	1—20 hp	.....
Cinder Return	1— 3 hp	.....
Pulverized Coal Mills	.....	2—125 hp
Feeders	.....	2— 1 hp
Total hp	27 hp	252 hp

Notes: Forced and induced draft fans on boilers No. 1 and No. 2 are identical; these are per boiler, F.D. 60 hp and I.D. 125 hp.
Air temperature to mills 700 F, transport temperature to burners 160 to 170 F. If transport temperature falls to 150 F, or lower, deposits of coal called "cakes" form in pipe. Transport pipe must be short and direct, turns and bends, together with long pipes, give plugging trouble.

Boiler and furnace data, also pulverizer mill energy requirements will be presented in Engineering Reference Sheet 52-4. Electrical World, February 25, 1952.

A STATION ENGINEER ASKS—

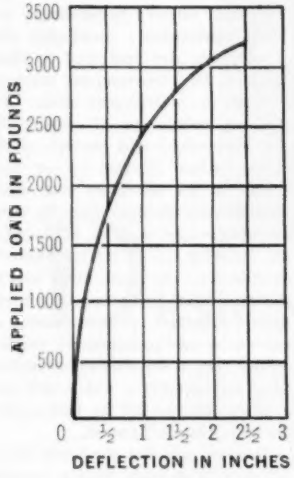
"Why is it necessary to shim 69 K.V. switch units ?"

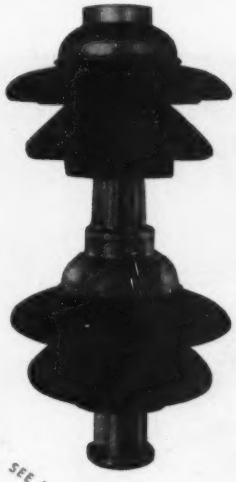
[redacted] *You don't have to when you use Pinco L-6069 Switch and Bus Units.*

[redacted]

The Pinco L-6069 Switch and Bus Unit employs a ribbed malleable iron pin to give it the rigidity and strength required in this unit's application.

[redacted] The deflection curve below shows the rigidity of the Pinco L-6069 Switch and Bus Unit under various loads. The secret of Pinco's perfect alignment even when horizontally mounted, lies in the balanced design of the porcelain and hardware.





SPECIFICATIONS

PINCO L-6069 SWITCH and BUS UNIT

Cantilever Strength, upright (Base mounted)	1500 lbs.
Cantilever Strength, underhung (Cap mounted)	1000 lbs.
Torsion Strength	15,000 inch lbs.
Tension Strength	12,000 lbs.

This Unit More Than Meets The Above Ratings

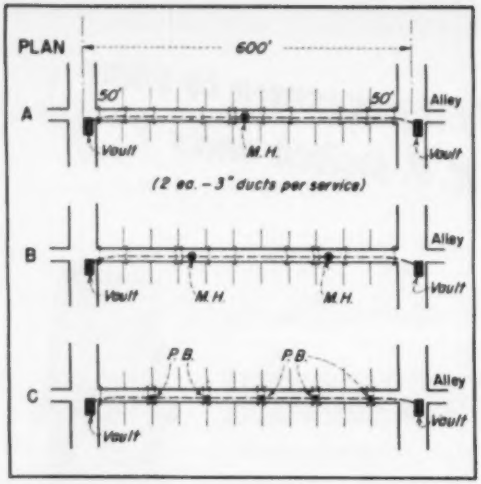
SEE PAGE 116, PINCO CATALOG NO. 49 FOR COMPLETE ELECTRICAL AND MECHANICAL CHARACTERISTICS

PINCO INSULATORS

RIGHT ON THE JOB!

The Porcelain Insulator Corporation
761 Main St., Lima, N. Y.

Sales Agents: **JOSLYN MFG. & SUPPLY CO.**
Offices in Principal Cities



MINIMIZING SERVICE RUNS through use of pull boxes smaller and less expensive than manholes enables Southern California Edison to keep underground service construction costs to a minimum. Costs vary widely, but remain in about the ratios shown in the tabulation above

Facilities Required by Alternate Plans

Quantities	Plan A	Plan B	Plan C	Saving*
Service duct paralleling alley (Feet)	2800	1600	220	1380
Extra excavation for service ducts (cu ft)	2400	1800	75	1725
One-phase service cable paralleling alley (100% saturation) (Circuit ft.)	1400	800	110	690
Three-phase service cable paralleling alley (50% saturation) (Circuit ft.)	700	400	55	345
Manholes	1	2	0	2
Pull boxes	0	0	5	(5)

* Plan C over Plan B

Approximate Installed Cost for Items Detailed*

	A	B	C	Saving
Structures	$ 3100	2600	1600	1000
Service cable	4400	2750	850	1900
Sub Total	$ 7500	5350	2450	2900
Cost per lot average	$ 340	245	110	135

* Note—Costs do not include items common to all three systems—transformers, transformer vaults, etc.

Secondary & Service Distance, Transformer to PL.

Average	Feet 225	190	190	0
Maximum	Feet 395	295	315	(20)

Pull Boxes Minimize Underground Service Runs

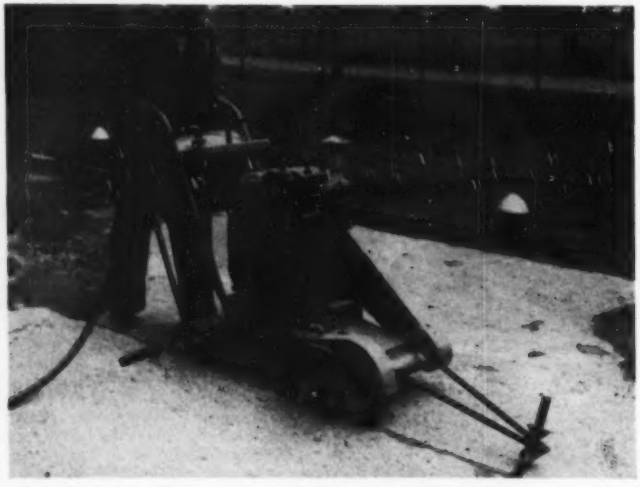
R. C. BLANKENBURG
Underground Engineer
Southern California Edison, Los Angeles

Substitution of pull-boxes for manholes has effected substantial savings in underground construction of Southern California Edison Co. Their lower cost permits more openings where connections may be made to the secondary, thereby reducing the quantity of service runs which double up over the secondaries. Variable costs which are not common to both methods of construction may be less than half for the pull boxes compared to a conventional one-or two-manhole per block construction. Installation time is only one day compared to about ten days for a conventional manhole.

Costs of underground service connections include cost of openings for the connections and portion of the service which doubles up or back tracks on the secondary run. Long runs between openings lower the number of openings required, but increase the doubling up of service over the secondaries. The much lower cost of the pull boxes compared to conventional manholes permits more of them to be used economically, keeping service runs to an absolute minimum. Ideal arrangement is with a pull box at every other lot line, as shown, serving both sides of the street.

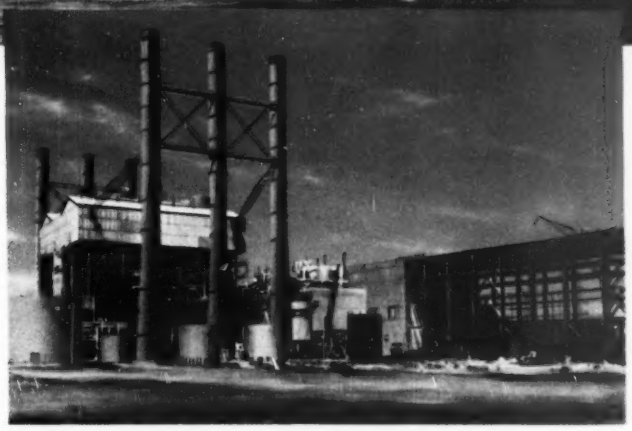
Standard size box used thus far is 2½ x 4 ft in plan, with a variable depth, generally about 3 ft, to meet local conditions. Normally four ducts go through the boxes, which are combined with primary duct run as shown. These ducts are intended for secondary runs, but they may be used for primary, communication, and alarm circuits.

Service connections to the secondaries in the pull box are made with multiple outlet connectors supported



"Concrete Cutter" Is Fast but Quiet

Concrete "breaking" has been reduced by a new concrete cutter now being used by crews of Consumers Power Co. Demonstrated by Jim Beardon of the Flint Division, the new equipment is faster and quieter than the old air hammer method. Containing black diamond points, the blade is capable of cutting neatly through 3 in. of concrete. Water required for cooling the blade is provided through the hose at the left. Location of guide blades is shown by arrows.



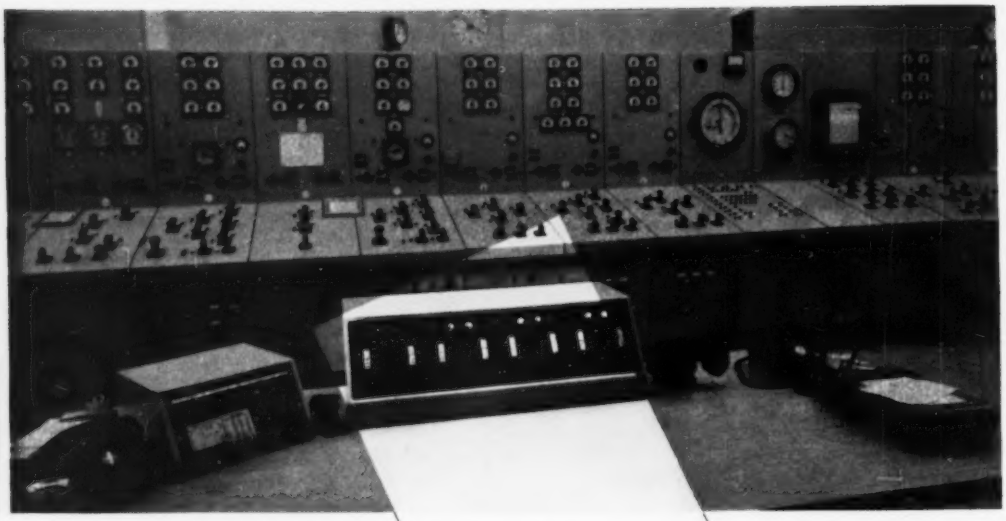
DESIGN FOR EXPANSION

The unit system of construction for steam power plants is the most economical when possible future expansion is contemplated. The first three 100,000 kw units with three 7,500 kw condensing house units of Pacific Gas and Electric Company's new Steam Station at Moss Landing, California, were completed in 1950. An extension including two additional units, embodying still greater refinements for operating efficiency, was authorized almost immediately. These units will be placed in service late in 1952 and will increase the nominal capacity of the station to 522,500 kw.

The entire plant was designed and is being constructed by Stone & Webster Engineering Corporation in collaboration with the Pacific Gas and Electric Company's Engineering and Purchasing Departments.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY *of* STONE & WEBSTER, INC.



Load distribution for 8 generators

controlled from this console

With the compact console shown above, the plant operator at Detroit Edison's Trenton Channel Station has full control of loading on the station's eight generators. The eight adjustable dials on the console are remote setters for L&N Unit Load Control; they permit him to divide the total station load among the individual generators in any desired proportion. When station load changes, the variations are automatically spread out among all controlled units—each one taking its allocated percentage of the total change.

The operator can also use this control to add load to new units on the line, and to unload a unit preparatory to shut-down. Normal operating experience shows that a plant can go through a daily load cycle with all load adjustments made from this control console.

29 Generators Regulated Together

This same control is applied to all four plants of the Detroit Edison system, and will be applied to a fifth plant. Altogether, 29 generators aggregating 1700 megawatts capacity now are operating under L&N load distribution control. Because system load changes are automatically spread out among 29 units, the load variations on individual generators and boilers have been greatly smoothed out. Automatic distribution of load swings has resulted in improved stability of system frequency and interchange over tie lines connecting to the rest of the interconnection.

Little Front-of-Panel Space Needed

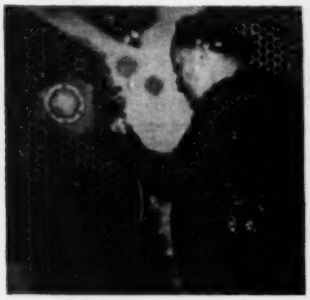
To add L&N Unit Load Control to present stations, the only front-of-panel space needed is that for signal lights and a selector switch for each unit controlled. All other control equipment can be located remote from the operating panel.

Our Technical Publication ND4-56-461(1) gives details on how control can simplify your station operating problem. For a copy, write to Leeds & Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Pa.

LEEDS NORTHRUP

Jrl. Ad. ND4-56-461(2)

by cable hooks with porcelain blocks. These junctions are arranged so they may be lifted up and away from the wall for maintenance or to change or add connections. Because this work is done outside the box, there is no need to provide working space and the box can be made small.



Neoprene Prolongs Condenser Tube Life

Neoprene lining applied by Union Electric Co of Missouri to inlet ends reduces erosion of condenser tubes. Tubes and tube sheets are thoroughly cleaned by wire brushing and sand blasting. Two coats of primer and eight coats of Neoprene base rubber compound are applied by spray-gun method. This provides a simple and inexpensive way of prolonging condenser tube life.

Use 120-v Outlets In Underground Network

L. Y. GROVE
Formerly Division Supervisor
Engineering Dept
Appalachian Electric Power Co
Roanoke, Va.

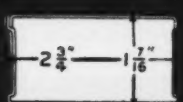
When the underground distribution network and whiteway street-lighting systems were planned for the business district of Roanoke, one of the problems was to provide a convenient 120-v source. The service is required for operation of electric tools, emergency lights for miscellaneous street jobs, and power for decorative lighting which the city requires during the Christmas season.

The problem was solved by installing a 120-v convenience outlet in each new street-lighting standard. This was possible because the new multiple street lights are supplied directly from

No. 1

Plugmold

The safe, efficient way to provide closely-spaced, correctly-located outlets for the convenient plug-in-anywhere of electrically-operated machines and equipment on assembly lines, work benches, inspection tables, in laboratories, engineering departments, offices . . . wherever it is essential to have all the outlets you need when you need them, where you need them.



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Send today for this new bulletin describing in detail the PLUGMOLD trio.

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THE WIREMOLD COMPANY
HARTFORD 10, CONN., DEPT. D
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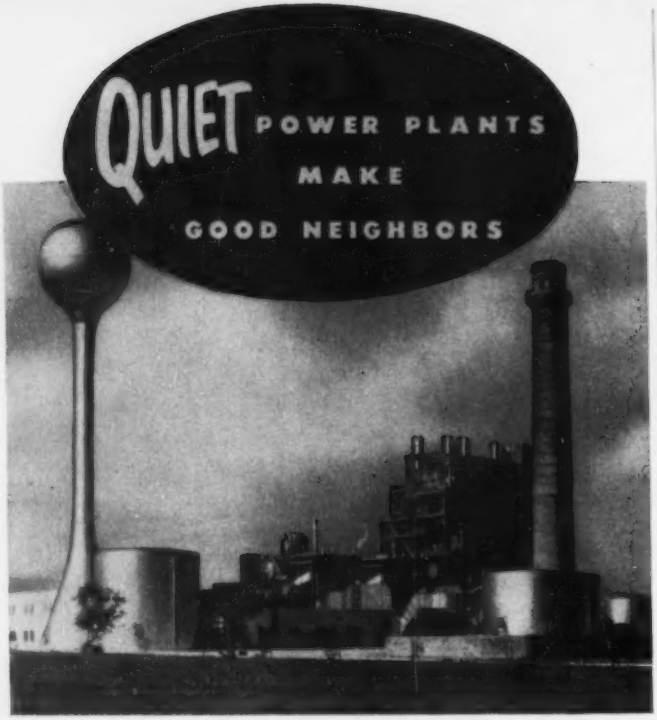
City _____ State _____



● Progressive power companies like the Florida Power and Light Company, whose Cutler Steam Electric Station is shown above, are silencing their operations with INDUSTRIAL SOUND CONTROL installations—and, in so doing, are insuring their precious public relations. ISC, through its specialized research and experience, effectively and economically suppresses noise in industrial operations.

ROAR . . . *of induced draft or forced draft fans can annoy residents over a wide radius.*

HUM . . . *of a transformer in a quiet residential neighborhood can be a nuisance at an amazing distance on a quiet night.*

CRASH . . . *of machinery can seriously affect employees, accelerating fatigue, slowing reflexes, and building up nervous tension — all accident breeders. Hearing may be permanently impaired, resulting in accidents and costly damage suits.*

INDUSTRIAL SOUND CONTROL, INC., was the originator of industrial soundproofing. Its installations, completely engineered to solve the individual noise problem, range from test cells for testing the most powerful jet engines to soundproofing a small compressor.

Don't wait until you are threatened with legal action—Call on ISC first. Write today for full information.

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● 1455 North Pennsylvania Street,
● Indianapolis 2, Indiana

Industrial Sound Control Inc.

45 GRANBY STREET HARTFORD, CONN.
2119 SO. SEPULVEDA BLVD LOS ANGELES, CALIF.

the 120/208-v network mains. Because each new standard came fabricated with a 3x5-in. handhole (to accommodate the pilot relay) located 5 ft above the base, this handhole was also used for the 120-v take-off receptacle. The latter and the pilot relay were mounted as a unit on a small steel plate, completely prewired, and supported on a tapped plate within the handhole. The assembly facilitated final connections of the street light supply and control wires.

Total material cost for this unit (not including the relay) was approximately 90 cents and the time required for each assembly was about 10 minutes.

Brush Control Methods on Del-Mar-Va Peninsula

NORMAN L. TAYLOR
Superintendent of Transmission
Eastern Shore Public Service Co of Md
Salisbury, Maryland

Ammonium sulphamate; 2,4-D and 2,4,5-T combination; and mechanical methods were used in a four-year experiment in the right-of-way clearing on the eastern shore of Maryland. By these tests ammonium sulphamate was found to be most effective although more expensive than other methods.

In the summer of 1948 ammonium sulphamate was applied to 10 acres of right-of-way on an experimental basis. Results of this application were very good, with a kill of 80 to 85%. In the summer of 1949 we treated an additional 200 acres and obtained a comparable kill. In the summer of 1950 we again treated another 200 acres with ammonium sulphamate and in addition treated a small amount of right-of-way with a 2,4-D and 2,4,5-T combination. A kill of approximately 90% was obtained in one section of right-of-way with the ammonium sulphamate, while immediately adjacent thereto the 2,4-D combination had a kill of approximately 60%.

In the summer of 1950 we shredded the brush and stumps on 10 acres of right-of-way by mechanical means and in cooperation with the State Game Commission planted this in a reseeding cover crop. Results obtained by these two treatments through the 1951 growing season showed ammonium sulphamate to have done a very effective job while the area which

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Saves money and Time for You!

Because Uptegraff Dry Type Transformers are safe to install anywhere and are light in weight, they do not require special rooms, enclosures, heavy foundations or floor supports. Initial cost is low, installation is relatively simple. Long, expensive bus runs are avoided because they can be located at or near the load center.

Uptegraff Dry Type Transformers are dependable and economical in service. The range of sizes includes transformers up to 2000 KVA, 3 phase, 15,000 volts.

R. E. UPTEGRAFF

MANUFACTURING CO.

Scottdale, Pennsylvania

Line foreman has trouble, calls for materials fast.

"RCA 2-WAY RADIO

cuts our outage time 90%"

says Mr. Milton Sturdivant,
Superintendent of Construction and Maintenance,
Brazos River Transmission Electric Co-operative, Texas

"WITH RADIO, our crew is on the job as fast as it formerly took us to reach a phone. *Radio is indispensable* . . . we just couldn't function without it."

RCA Radio covers big Texas utility

The Brazos River System stretches out over 100,000 square miles of Texas . . . includes steam plants, hydro plants, and 1000 miles of 69 KV lines. RCA 2-way radio operates from seven base stations in power plants, linemen's homes, and 28 mobile stations in cars, pick-ups, and trucks. Maintains instant voice contact between supervisors, foremen, load dispatchers, line crews, line patrolmen. Three years on the job, 2-way radio is giving the vital communications that keeps the system running smoothly.

Could your operation use radio?

Everywhere it's applied, *RCA 2-way radio works wonders*. Saves time, manpower, money. Ends aimless driving. Saves wear and tear. Speeds repairs in emergencies. Pays for itself many times over through better, more efficient operation.

Radio easy to install—operate—maintain

Mobile units are compact, rugged . . . can be installed in truck or car quickly and efficiently. Easily maintained, use standard tubes. Central transmitter serves any number of mobile units. Designed and backed by RCA . . . world leader in radio.

Get full story on RCA 2-way radio now. See how it can help out on your operation. Mail coupon . . . TODAY.

Near-by line truck is ordered to rush materials to trouble spot.

Meanwhile field superintendent also drives to trouble spot.

Dept. 45BC, RCA Engineering Products Department, Camden, N. J.

Please send my FREE copy of illustrated booklet on how RCA 2-way radio can save time, manpower, and money for me.

Name_____

Title_____

Company_____

Address_____ City_____ State_____

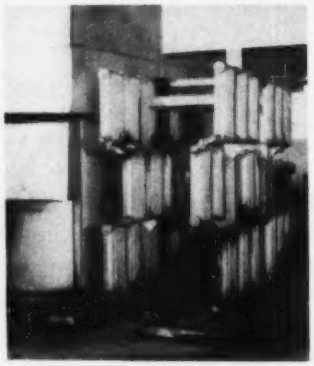
RCA RADIO CORPORATION of AMERICA

was shredded and seeded showed considerable regrowth. Whether this was due to an ineffective seeding job we were unable to determine. However, we plan to test the mechanical treatment further.

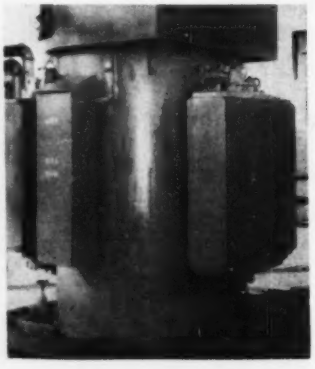
In the summer of 1951 we treated with ammonium sulphamate a fourth area of approximately 150 acres, which had two years of regrowth, at an economical cost per acre.

In the late winter of 1950 we treated stumps on a newly cut right-of-way. This showed good results during the next growing season.

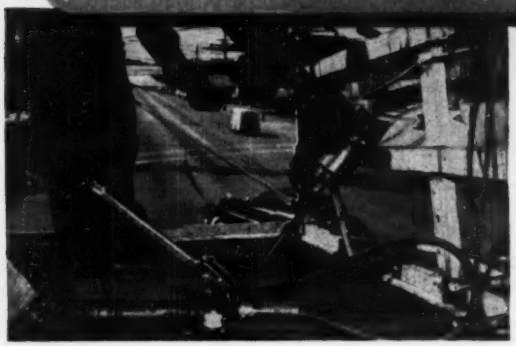
Hollow-Fin Radiator Retires Cast Iron Type



Cast iron radiators (top) which provided adequate cooling for a 150-amp, 12-kv regulator of San Diego Gas and Electric Co for 16 years have been replaced by a modern hollow-fin type (lower.) Regulator was originally water cooled; hollow-fin radiators were substituted by J. B. Bowen, electrical maintenance superintendent, when the regulator was moved to a site which was without cooling water.



How Burndy Hysplicing Cut Installation Costs 70%



HYSPLICE

70% saved!

You may not repair overhead transit lines, but the story of how Seattle Transit System reduced splicing time on corroded guy wires from 20 minutes to 3 minutes may well apply to your operation.

The "secret" is the Burndy Hysplice installed with the Burndy Hypress Y48B, a portable hydraulic press weighing only 27 pounds but developing 40 tons, *80,000 pounds*, of force... a weight/force ratio unequalled for easy handling of splices and connections on larger cables.

In this application the corroded section is replaced with a three-foot length of new wire, coated at both ends with corrosion resistant "Penetrox A" and inserted into the Hysplice. The enormous force of the Hypress crimps the Hysplice in a four-indentation die—completing each crimp in a single operation. Time? Just about three minutes to replace an entire section—even less if one side of the splice is made up in advance. A 70% time and manpower saving over the old fan splice method. And since the Hypress can install splices up to the rated breaking strength of a cable, pull-out tests prove its adaptability to any type of service in the field.

Perhaps costs can be cut, efficiency improved, in some phase of *your* operation. Call Connector Headquarters...

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52-4

High Bay Relighting—at Low Cost

Nominal cost, economical operation on standard voltage, and low maintenance are the reasons company officials of Specialty Steel Products, Inc, Braddock, Pa., are well pleased with their new reflector lamp high bay lighting installation. Lighting intensity is approximately 23 ft-c, uniformly distributed throughout the 40 by 120 ft shop. Installation consists of ten 750-w reflector lamps on 20 by 15 ft centers, mounted 30 ft above the floor. Lamp cleaning is unnecessary. Only maintenance required is burned-out lamp replacement. A. M. Longord, Industrial Representative, Duquesne Light Co, Pittsburgh, Pa.

You Can Heat Molasses Electrically

Hugh S. Evans, Jr
Industrial Power Dept
Nashville Electric Service

This application data will be useful in solving difficult problems of heating molasses and syrups similar to the one published on page 146 of the November 19, 1951 issue of Electrical World.

Electricity is advantageous where it displaces labor as is done when it eliminates the need for firing a boiler in the summer months, thus decreasing boiler maintenance and fuel cost—the latter effected by bettering the overall efficiency. During warm weather feed mills ordinarily use steam only for heating molasses and for pellet mill operation and electric heat may easily be applied. Electricity has already proven itself capable of providing steam for pellet mills and electric boilers are in many cases used the year around with good economic justification, so whether pellet mills are used or not, electricity can frequently be used either seasonally or on an annual basis to the customer's advantage and benefit.

Since one of the best applications of electric heat in this field is the heating of molasses for mixing with cattle feeds, this article will be slanted toward this use. It should be noted that there is a considerable difference between sugar syrups and molasses so the data given should be used judiciously.

In molasses heating applications the points to be considered are the specific heat, viscosity, density and the carbonization or breakdown point, all of which affect the maximum rate of heat transfer. The specific heat of aqueous sugar solutions is almost a straight line function, as shown in Fig. 1 but these data do not apply to molasses because of solids, etc. normally encountered. The specific heat of molasses may be taken as 0.5, but where it is desirable to have a more accurate value the following formula can be applied provided an analysis of the molasses is available:

$$S = \left\{ 1 - [0.632 - 0.001\,T + 0.0011\,(100 - P)]\,[B/100] \right\}$$

Where S, Specific heat, btu/lb deg F
T, Temperature, deg F
P, Purity, % sucrose
B, % solids.

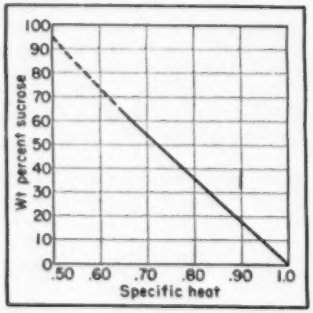


FIG 1—SPECIFIC HEATS of aqueous sugar solutions is almost a straight line function. This does not apply to molasses because of solids, etc. normally encountered

Viscosity values vary tremendously with the type and run of molasses, even from the same source. For example, published tests on twelve final molasses runs showed viscosities of less than 25 poises at temperatures above 150 F while at 100 F the values ranged from 300 down to 25 poises with a mean value of 125 poises. In another instance the manufacturer states that the viscosity varies from 6,000 to 60,000 SSU (approximately 18 to 180 poises) at 100 F and gives the viscosity of refiner's blackstrap at 100 F as 1600 centipoises while at 140 F it is 400 centipoises. Still another manufacturer gives a variation in blackstrap of from 489 to 1933 centipoises at 102 F while at 156 F it varies from 156 to 654 centipoises.

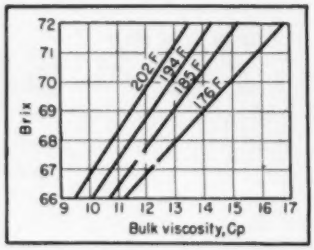
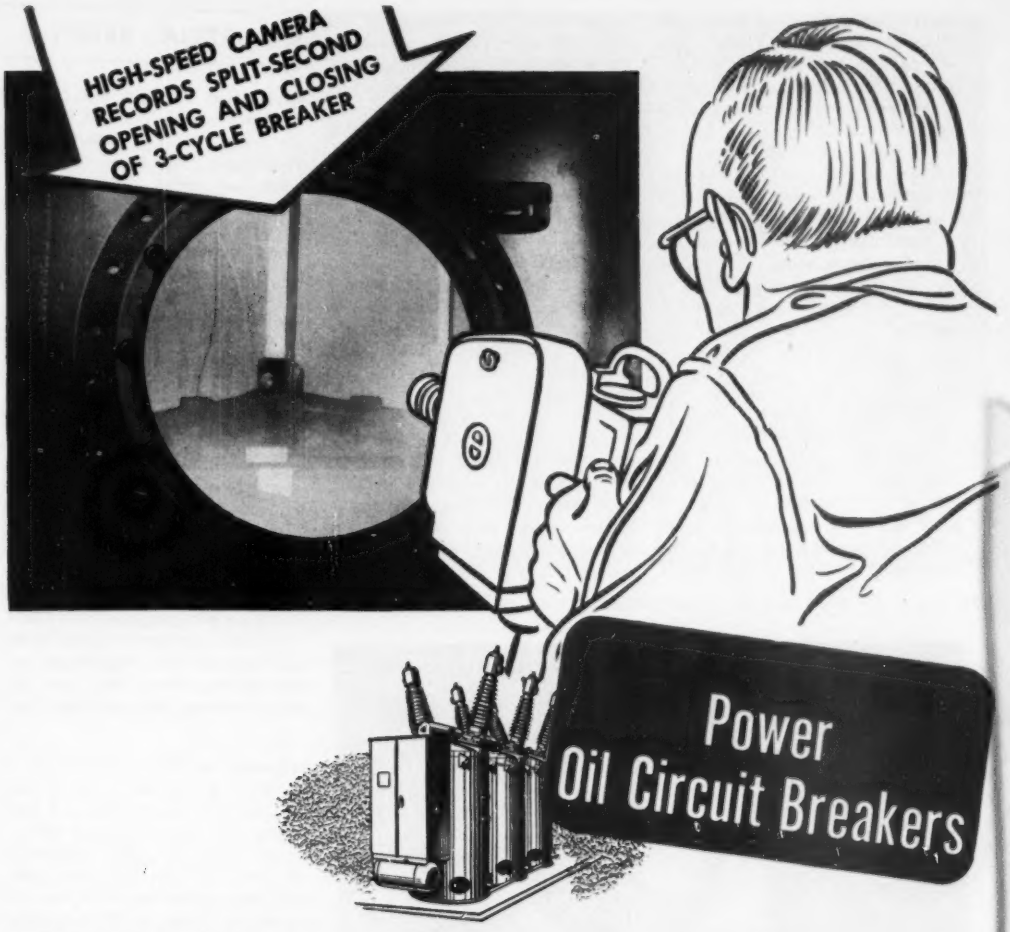


FIG 2—MOLASSES VISCOSITY plotted against deg Brix (percent sucrose) may be used if an analysis is available

Fig. 2 shows the viscosity of molasses plotted against deg Brix (percent sucrose) and may be used if an analysis is available. Such a wide



Positive Protection...

TODAY'S heavily loaded, complex transmission systems require dependable high-speed electrical protection. And Allis-Chalmers circuit breaker engineers are continually developing and testing new designs to provide faster performance and higher interrupting capacities.

Special test equipment permits detailed study of mechanisms in motion, including even the fastest operating parts. High-speed photography, for example, permits contact travel in oil to be recorded through a transparent manhole cover.

Extensive tests are made on each new design — first on separate components, then on the complete circuit breaker. Customer surveys confirm the importance of our emphasis on sound mechanical design and thorough testing.

Get the complete story on Allis-Chalmers circuit breakers from your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3161

ALLIS-CHALMERS

range in viscosity values clearly indicates that even in a product with nominally the same physical characteristics specific information must be obtained unless only a general problem solution is desired.

The density of molasses also varies but may be taken as 11.7 lb per gal without serious error, the normal specification calling for 11.7 lb/gal at 60 F, 41 deg Be. To determine the density of sugar solutions when the Brix number (percent sucrose) is known the following relation can be used:

$$Br = \frac{(d - 1)}{.0038}$$

Where Br, Brix number
d, Density of solution.

All available data indicate that while molasses starts to decompose at 140-150 F, it is usually heated to about 120 F (and occasionally up to 180 F) for spraying into feed. The temperature at which molasses begins to decompose is a function of the amount of water and non-sugars present as well as the total time at heat. Some sources state that molasses issues from rotary drum driers at temperatures up to 170 F without being in any way decomposed or caramelized. In agitated heating tanks, steam at pressures up to 150 lb (366 F) is commonly used for heating without forming deposits on the coils.

The above data may be very useful in calculating heat transfer rates from empirical relationships similar to those presented in McAdams' "Heat Transmission." Where electric heat is used as direct immersion, such as clamp-on or air heaters, care should be taken to limit the surface temperature of the vessel to 350 F or keep the watt density down to at least 4-½ w per sq in. While higher watt densities have been used, conservative values are recommended because of the wide variation in the physical properties of the various factors involved.

Westinghouse Electric Corp

Radio Control Speeds Industrial Trucks

Radio Dispatching System between industrial truck operators and a central dispatching office has greatly speeded up and organized intraplant shipments at the Westinghouse Appliance Division Plant, Mansfield, Ohio. Two-way communication enables one dispatcher to handle entire fleet of trucks by keeping an up-to-the-minute record of truck operators' call-in reports. Any truck operator in the plant can be given shipment orders along with all essential information as to the most accessable storeroom possessing the proper quantities of the materials to be moved.

INDUSTRIAL BRIEFS

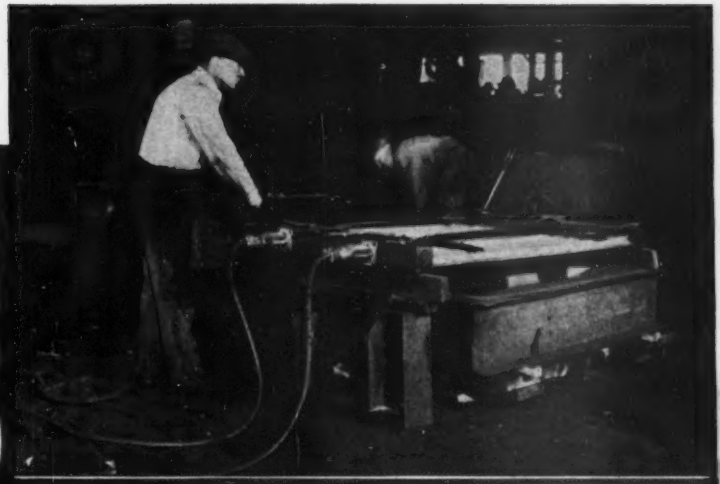
Drying Gun Carriages with rod type resistance heaters in a new type drying tunnel at C.A.M. Industries, Inc, Philadelphia, Pa., has kept defense production rolling at high speed. Sprayed finish on reconditioned gun carriages is dried in 15 to 20 min. in tunnel having 132—2kw U-shaped rod type resistance units arranged in panels. Electric fans help keep all heating zones at correct temperature. L. Albertson, Application Engineer, Market Studies and Service Division, Philadelphia Electric Co.

Painting metal chairs using electrostatic atomization and deposition at Interstate Metal Products, Inc, Michigan City, Ind. produced four times as many chairs per gal of paint as former hand spray methods, at rate of 1300 chairs per day and requiring only one touch-up man. Conveyor speed is 11.5 ft per min compared with 7 to 8 ft per min required by former hand spray method, with which three men produced only 550 to 600 chairs per day. Ransburg Electro-coating Corp.

Reflowing Tin when making tin plate by electrolytic process at Jones and Laughlin Steel Corp's, Aliquippa, Pa., plant sets new speed record of 2000 ft per min—over 10% faster than previous lines. RF generators total 1800 kw. Adjustable-voltage drive has 134 d-c motors totaling 1450 hp in sizes from 2 to 200 hp. All motors function as a unit during starting, stopping, and as speed changes over a range of approximately 10 to 1. Westinghouse Electric Corp.

High Degree Electrification and full use of automatic controls has increased production over 20 times in the past 6 yrs at Skinner Electric Div. of the Skinner Chuck Co, Norwalk, Conn. Man-hours per unit produced has been cut sharply. Forty electric motors drive the 28 main production machines. Each valve manufactured requires but 1 kwhr of electrical energy. High-speed machining of stainless steel is basic shop operation. Despite great increases in labor and material costs these modern methods have kept price advances below 10% in past 5 yr.

TIREX HELPS TAKE THE BUBBLES OUT OF STEEL CASTINGS



Foundries "skin dry" molds so that the molding sand will not give off a gas and cause bubbles or porosity in the casting.

Until a short time ago it was common practice in most foundries to skin dry molds with an open kerosene torch. It was slow, hot, dirty, disagreeable work and a moment's inattention could result in a burned and spoiled mold.

A Milwaukee foundry decided to get rid of this dirty, slow job of skin drying molds. They had infrared ray heaters developed. These heaters not only did away with the drudgery of the job but gave the foundry several unexpected dividends. First, the labor of the man drying the mold was eliminated. Second, spoiled molds became a thing of the past. But better still, because the infrared ray heaters were faster than the open kerosene torches, it was possible to dry an additional mold each day and that is a considerable dividend.

Of course the infrared ray heaters demanded a dependable pathway for power and that they got in TIREX Cables. This picture shows TIREX Cables connected to the heaters. TIREX not only operates dependably day in and day out but it safely combats the sharp abrasive foundry sand, it eliminates the danger from cable fires caused by flying molten metal sparks, and it takes in its stride the everyday abuse that is part of the job.

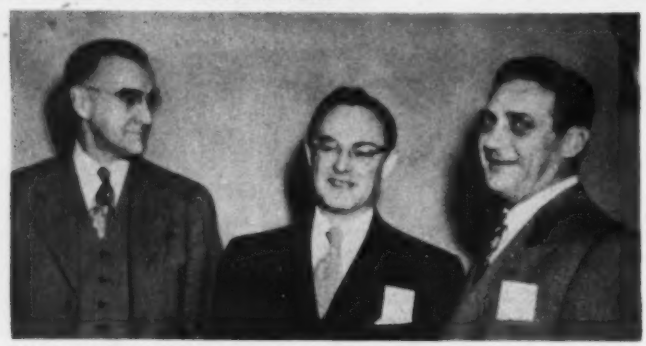
Isn't that the kind of service that you want from your portable cords or cables? Of course it is! This kind of service was deliberately built into TIREX Cords and Cables. They are a product of Simplex research.

Simplex research gave you the first heavy duty, rubber-jacketed portable cord or cable; the first low water absorption insulation; the first rubber-jacketed underground cable. Besides these notable "Firsts" Simplex research has provided a great many developments which have enriched the art of cable design.

SIMPLEX-TIREX IS A PRODUCT OF SIMPLEX RESEARCH

SIMPLEX-TIREX

SIMPLEX WIRE & CABLE CO 79 SIDNEY ST CAMBRIDGE 39 MASS



TALKING WIRING PROBLEMS are, left to right, H. H. Watson, General Electric Co; Howard Stevenson, Detroit Edison Co; and R. M. Douglass, Dallas Power & Light Co

CMP Allows Adequate Wiring

National conference finds copper limitation allows most homes now being built to be wired adequately. Substitution of aluminum not of immediate concern

"I tell the customer the benefits of an adequately wired home and ask for the order. It's as simple as that," Quentin M. Johnson, an electrical contractor of Fargo, N. D., told the eighth annual National Adequate Wiring Conference at the Sherman Hotel, Chicago, Jan 24-25. Mr. Johnson said "the customer likes it and I make more money selling adequate than inadequate wiring."

Wiring can meet the requirements of the adequate wiring program in homes of 1400 to 1500 sq ft with 35 lb of copper, M. E. Mentzer of the Rocky Mountain Electrical League, told the conference. Mr. Mentzer said that contractors are urged to send plans for new homes to the Rocky Mountain Electrical League and the League helps them plan an adequate wiring job under CMP restrictions.

Service entrance requirements, wiring standards, the degree of electrical living and the value of homes being built were the four factors entering the adequate wiring problem under CMP regulations, said C. B. Osborne of the Electric Power Board of Chattanooga. In an area where average annual kwhr use is 6500, Mr. Osborne said that a survey indicated 60 lb of copper per home had been required for wiring homes prior to CMP regulations. The Electric Power Board furnishes cable to the meter. Savings were effected by planning the location of meter and service entrance, elimination of square turns in wiring and more careful planning of wiring.

Looking toward aluminum conductors as the possible solution of the copper shortage problem over the long-term, R. W. Wilson of Kentucky Utilities Co enumerated the problems involved, such as electrolytic action, brittleness, lower conductivity and others and said that there is no doubt these problems can be solved. Talking on the same subject D. G. Kimball of General Electric said that care should be exercised in the use of aluminum in the wiring of homes.

Running services direct from meter straight up to required elevation, instead of around the house and to a gable, will save some copper, B. O. Bowlus of the Greater Toledo Adequate Wiring Bureau said.

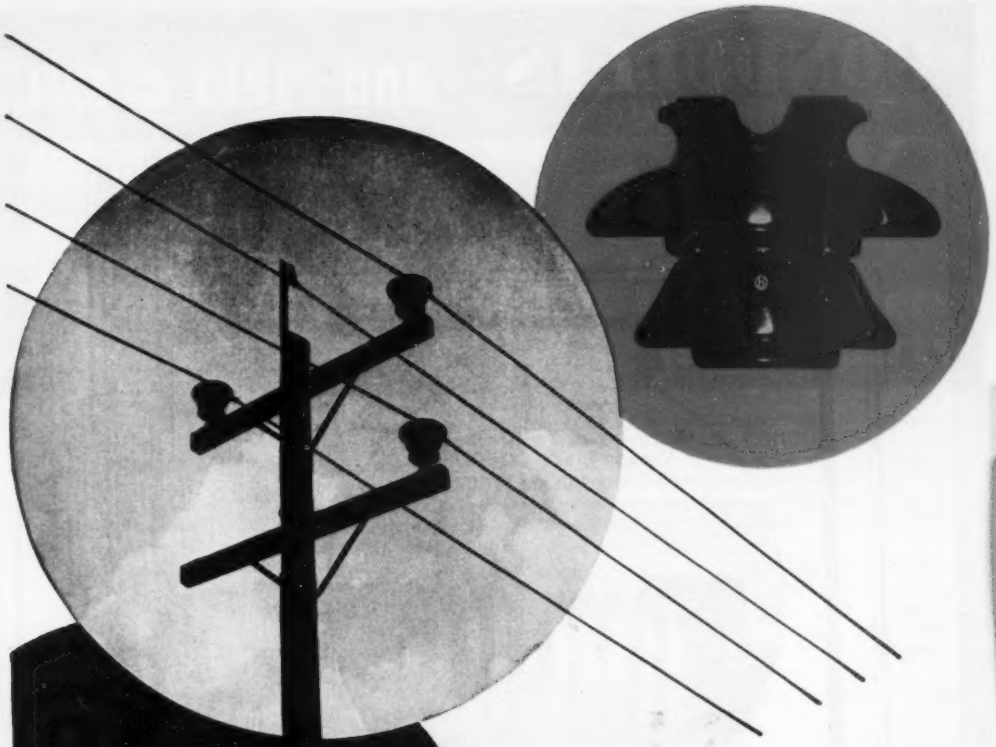
Dallas jumped certified wiring installations from 1.4% of 770 homes built in 1949 to 6.9% of 7,928 homes in 1951 through an adequate wiring program, R. M. Douglass of Dallas Power & Light Co said. The last year without a program was 1949. In 1950 there were 10,641 homes built and 4.6% were certified.

Morris Silverman, a builder in Dallas, told how a prospective buyer's requirement of a guarantee on amper-

(*Continued on page* 132)

PROBLEMS OF ADEQUATE WIRING under CMP can be solved, they agreed. Left to right, C. B. Osborne, Electric Power Board of Chattanooga; A. H. Jones, Madison Electric Co; Y. L. Ripley, West Penn Power Co; and R. W. Wilson, Kentucky Utilities Co

BEFORE THE CONFERENCE opened, A. J. McGivern, Chicago Electrical Wholesalers; W. T. Reece, Commonwealth Edison Co; Lyle Foster, Foster Electric Co, Peoria, general chairman of the conference; and C. C. Simpson, Chicago Electric Association



WHEN YOUR LINE MUST *stay on the job*

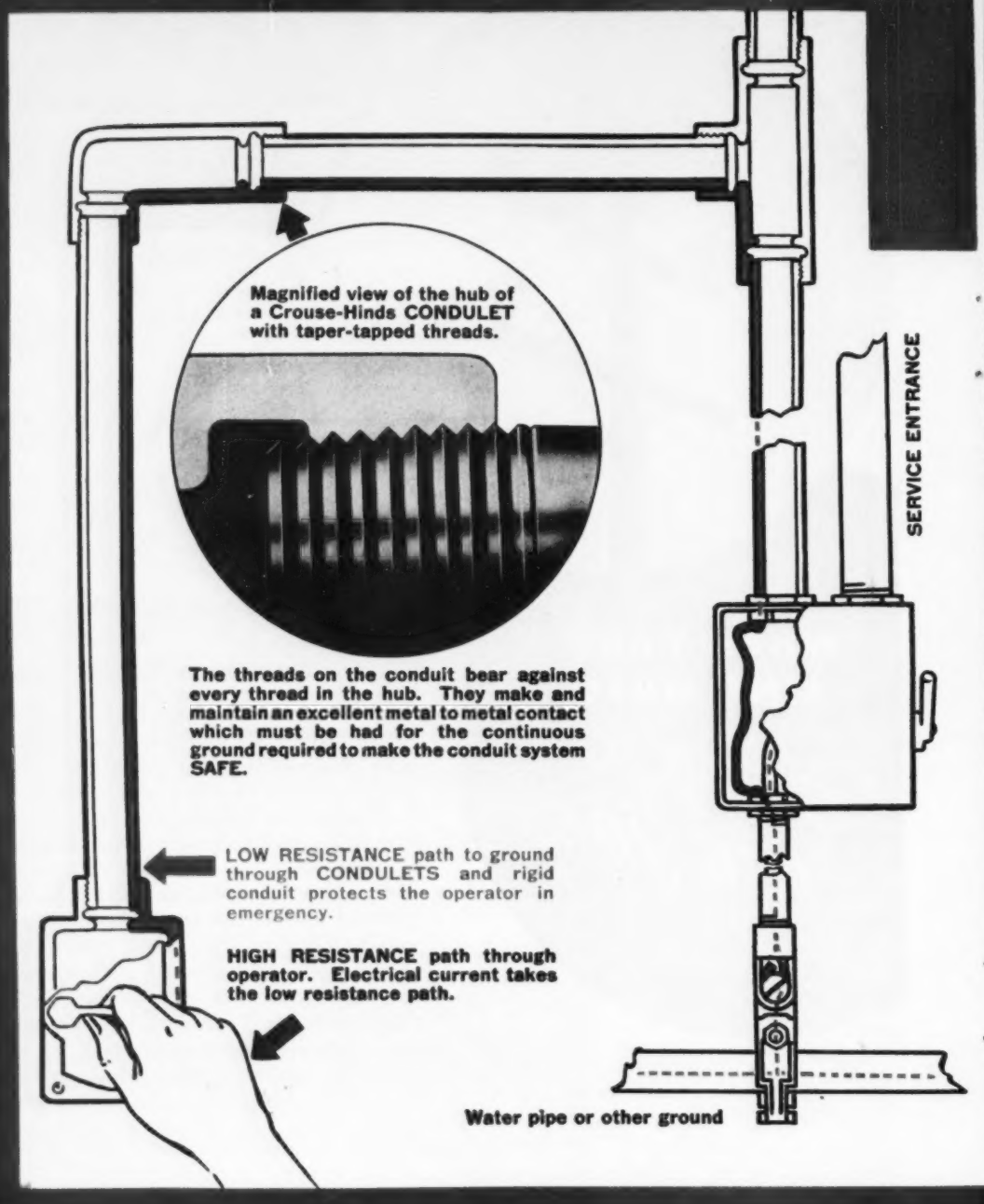
. . . . . Consider These Facts

Let's look at some *facts* on pintype insulator performance. This line was energized in 1917 at 44 kv, using 55-kv O-B pintypes. In 1920, voltage was raised to 69 kv on the same insulators. For 31 years the insulation has been living on part of its safety factor . . . The territory through which this line passes has an official 30-year average of 46.2 annual storm days. In the last five years, the first two of the 1,300 O-B pintypes have been replaced due to deterioration, although neither caused an interruption. Today, the line still handles an important industrial load . . . Thirty-four years of insulator service; 31 of which over-loaded -- more than 46 annual storm days -- only two replacements in 1,300 when the line was 29 years old, and these not causing an outage -- *facts* such as these point to the soundness of specifying O-B pintypes for lines that must stay on the job!

Ohio Brass

MANSFIELD • OHIO

CONDULETS* and rigid conduit


Magnified view of the hub of a Crouse-Hinds CONDULET with taper-tapped threads.
The threads on the conduit bear against every thread in the hub. They make and maintain an excellent metal to metal contact which must be had for the continuous ground required to make the conduit system SAFE.
SERVICE ENTRANCE
LOW RESISTANCE path to ground through CONDULETS and rigid conduit protects the operator in emergency.
HIGH RESISTANCE path through operator. Electrical current takes the low resistance path.
Water pipe or other ground

... the wiring method that gives you maximum SAFETY for workers AND property

Typical CONDULETS

Type T Obround Conduiet

Type LR Obround Conduiet

Type FS Conduiet

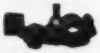
Type WMK Enclosed Safety Switch Conduiet

Type VC Vaportight Industrial Lighting Fixture

Type EVA Explosion-Proof Industrial Lighting Fixture

Type GUAC Explosion-Proof Junction Conduiet

Type EPC Explosion-Proof Line Starter



Type GCH Groundulet Safety Circuit Equipment

A low resistance grounding circuit is of vital importance in any electrical system. The combination of rigid conduit and CONDULETS provides the safest installation because this combination assures the permanence of the grounding circuit. In any grounding path, every joint that isn't tight in the beginning or loosens from vibration makes a high resistance point. Such high resistance creates a hazard for workers and can cause disastrous fires.

All rigid conduit has tapered threads and all CONDULETS (made only by Crouse-Hinds) have taper threaded hubs. This combination makes a secure joint that is tight in the beginning and stays tight. These joints will not loosen from vibration and assure a reliable and permanent low resistance path to ground. This SAFETY feature provides maximum protection against personal injury and fire.

Besides safety, a CONDULET installation gives you these additional definite advantages:

- **MECHANICAL PROTECTION.** Crouse-Hinds sturdy cast Feraloy CONDULETS and rigid conduit provide the best possible protection against accidental damage to the wiring and equipment. Prevents costly shutdowns.
- **FLEXIBILITY.** To meet all the diverse requirements of modern electrical layouts, CONDULETS are made in a wide variety of shapes and sizes with varied hub arrangements, including a full line of CONDULETS with detachable hub plates.
- **ECONOMY.** The installed cost of Crouse-Hinds CONDULETS and rigid conduit compares favorably with other wiring methods. The added advantages make it the really economical method that pays dividends over the years.
- **CORROSION RESISTING.** Cast Feraloy CONDULETS give the best protection wherever moisture, dust, or corrosive atmospheres are present.
- **UNIVERSAL APPLICATION.** You can install galvanized CONDULETS and galvanized rigid conduit under all atmospheric conditions and in all occupancies.
- **QUALITY.** The trademark CONDULET stands for the highest quality, reliability, and long life.
- **VARIETY.** More than 15,000 items are listed in the CONDULET Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations.

On YOUR next electrical layout, plan to get all the benefits of sturdy cast Feraloy CONDULETS and rigid conduit . . . the universal wiring method.

* CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES: Albuquerque—Birmingham—Boston—Buffalo—Chicago—Cincinnati—Cleveland Dallas—Denver—Detroit—Houston—Indianapolis—Kansas City—Los Angeles—Milwaukee Minneapolis—New York—Philadelphia—Pittsburgh—Portland, Ore.—San Francisco Seattle—St. Louis—Washington. RESIDENT REPRESENTATIVES: Albany Atlanta—Baltimore—Charlotte—New Orleans—Richmond, Va. Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

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leading photoelectric control

FOR STREET LIGHTING

The F-P Series 63300B Control is the latest unit in a proven line of photoelectric controls for street lighting that have been operating successfully on lighting circuits for over seven years. Today there are more than 35,000 F-P Controls in use by over 700 utilities.

Fisher-Pierce has maintained leadership in photoelectric street lighting control through:

PERFORMANCE — F-P Controls provide street lighting safety because lights are on *when needed*, regardless of time of day. Because the control is photoelectric, it depends only on natural light values for operation. There is no mechanical device to get out of phase with actual daylight conditions.

ENGINEERING — The F-P Series 63300B circuit and technical operating features are the result of years of field experience. The development work and testing was performed in conjunction with utility engineers. The Fisher-Pierce organization is in a position to help utilities in planning, installing and maintaining control systems.

ECONOMY — F-P Controls provide true economy: purchase price and cost of installation are low. Maintenance is practically negligible as compared to other control methods. To give you a picture of this F-P economy, we will be glad to refer you to some of our customers who have had extensive field experience with these controls.

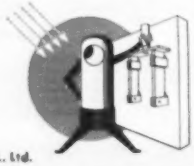
Write for Bulletin 63300B.

The FISHER-PIERCE CO., Inc.

82 Pearl St., So. Braintree, Boston 85, Mass.

EXPORT: PHILIPS EXPORT CORP. 100 E. 42nd STREET NEW YORK 17, N.Y.

IN CANADA: NORTHERN ELECTRIC CO., Ltd.



age of circuits brought home to him the value of adequate wiring in the selling of homes. He investigated, determined the need for certified adequate wiring, changed his building plans to meet requirements and has found that adequate wiring certification signs do help to sell homes.

Lee W. Helgerson of the Wild Rice Electric Cooperative told how his organization has put together many parts of an adequate wiring program in order to do a thorough job. These include publicity, exhibits at fairs, cooking schools, 4-H Club meetings and others. Mr. Helgerson said that these many parts have made a program that pays.

The 1952 adequate wiring program will be directed chiefly toward wiring modernization, Frances A. Armin of the National Adequate Wiring Bureau told the conference. Consumer advertising will be used chiefly, Miss Armin stated.

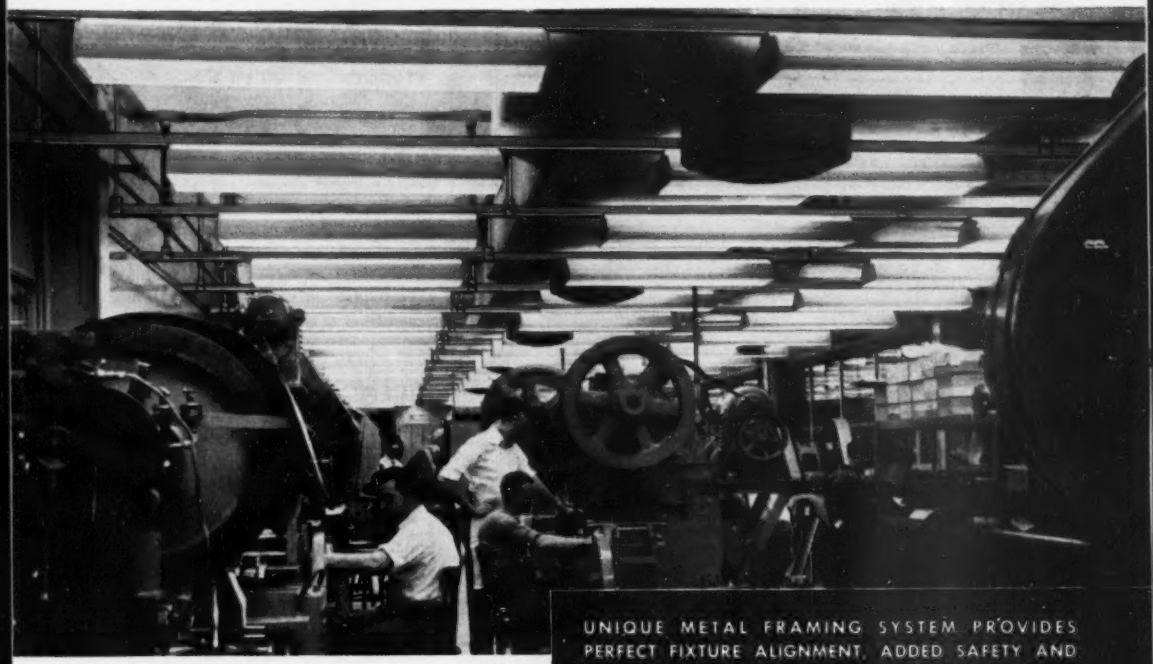
Presidential Campaigns—Courtesy, Westinghouse

Nationwide television and radio coverage of the 1952 presidential election campaign will be sponsored by Westinghouse Electric Corp over the Columbia Broadcasting System TV and radio networks. Called the most complete program package ever developed for a presidential campaign, it will include full coverage of both political party conventions in Chicago, a 13-week non-partisan "Get-Out-the-Vote" campaign, and election returns the night of the election on November 4. The "Get-Out-the-Vote" campaign will start in August and continue until the night before the election. It will offer equal time to both major parties to present their campaign issues through their candidates and other leading political figures.

Spurs Home Lighting Promotion

For outstanding performance in home lighting promotion a group of electrical distributor sales managers will receive recognition next June. They will be the winners in a competition recently announced by the American Home Lighting Institute, an association of fixture manufacturers. Equal prizes will be awarded in two classifications—sales managers in cities under and above 100,000 population.

ADJUSTABLE UNISTRUT CHANNEL, HANGERS and FITTINGS INSTALLED by METALS & CONTROLS CORPORATION to SUSPEND FLUORESCENT FIXTURES



UNIQUE METAL FRAMING SYSTEM PROVIDES PERFECT FIXTURE ALIGNMENT, ADDED SAFETY AND COMPLETE FLEXIBILITY FOR LATER CHANGES OR ADDITIONS IN BIG PLANT RELIGHTING JOB.

*Planned and executed by G. E. Pieper, Materials Engineer, Spencer Thermostat Division, Metals & Controls Corporation, Attleboro, Mass.

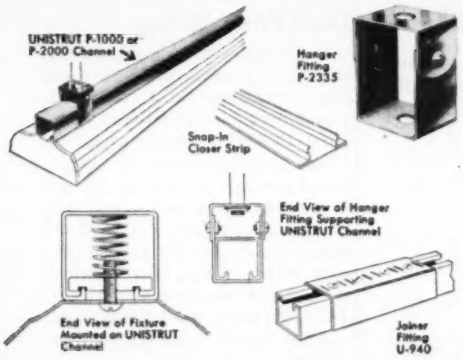

UNISTRUT P-1000 or P-2000 Channel
Hanger Fitting P-2335
Snap-In Closer Strip
End View of Hanger Fitting Supporting UNISTRUT Channel
End View of Fixture Mounted on UNISTRUT Channel
Joiner Fitting U-940

Photo shows rows of 2-lamp 40-watt luminaires supported from overhead "I" beams by UNISTRUT channel, hangers, stems and beam clamps. The versatile UNISTRUT system permitted attachment of supporting stems at any point along the channel length so that luminaires could be spaced at regular intervals without interference from overhead piping or duct, and in spite of varying distances between beams. (Photograph by Metals & Controls Corporation.)

The functional UNISTRUT method of hanging fluorescent fixtures provides advantages obtainable by no other means. Permits faster, easier, more accurate installation. Requires fewer hanger stems and canopies. Cleaning and servicing cannot disturb fixture alignment. Lowers wiring and rewiring costs. UNISTRUT channel is approved as wireway in Chicago and 20 other major cities—additional proof of its versatility and usefulness. Try it on your next lighting job!

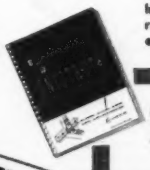
FOR DEFENSE PRODUCTION

Every day the value of UNISTRUT products is being proved by their use in Defense Industries and Armed Services installations where flexibility, and assembly and erection speed count most. The UNISTRUT method conserves steel, reduces manpower hours, cuts overall costs!

Representatives and Warehouse Stocks in Principal Cities. Consult your Telephone Directories

UNISTRUT Products Are Bonderized

U. S. Patent Numbers
2327547 2329815
2345650 2363382
2380379 2405631
2541908
Other Patents Pending



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Write today for your FREE Copy of New 78-page Catalog No. 7001 Includes above drawings and countless other examples of how to mount, rack, frame, suspend and support all kinds of electrical and mechanical equipment.

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Please send without obligation the items checked below:

☐ Catalog No. 700 ☐ UNISTRUT Sample

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Company_____

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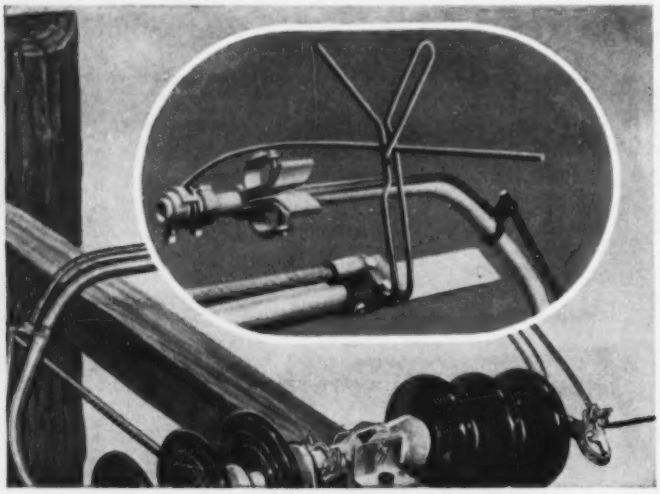
KPF POLE TOP SWITCHES



Drop 40 miles of 69 kv lines with KPF Quick-Break pole top switch

Operating engineers tell us KPF switches with Quick-Break attachment are the most outstanding air-break switch improvement in 25 years. Before development of this Quick-Break device, pole top switching of 69 kv circuits was limited to some 6 miles of line. Now, operating experience shows that 40 miles of 69 kv line can safely be dropped with this equipment.

The secret of the KPF Quick-Break is a heavy-duty cat's whisker which whips free in a split second as the switch is opened. This mechanism prevents establishment of an arc; thus critical arc length is no problem.

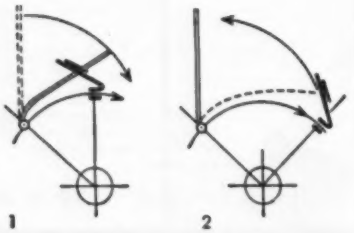
The KPF Quick-Break attachment is simply and ruggedly constructed for low cost, long life and all-weather dependability. It is available for all KPF switches rated 15 to 69 kv.

HERE'S HOW KPF QUICK-BREAK WORKS

1. Spring rod winds to full tension as switch opens.

2. Rod springs clear, breaking contact at high speed.

Write for details of KPF Quick-Break attachment and low cost, long-lasting, easy-to-install KPF Switches.



KPF ELECTRIC COMPANY
1624 E. Alpine Avenue • Stockton, California

First winner in each classification will receive $1,000, an engraved gold watch, a citation scroll, and traveling expenses to the annual convention of the National Association of Electrical Distributors at Atlantic City in June. Second winner will get $250, a watch and a scroll. Fifty runners-up will receive honorable mention and a citation.

Entries in the competition will recite the performance and results of a three-point merchandising program devised by the contestant and carried out in the first four months of 1952. The three aspects are sales training, promotion methods and advertising, and local newspaper publicity explaining modern home lighting.

ILE&C Exhibit Space A Sell-Out

Complete sell-out of all exhibit space is indicated for the Fourth International Lighting Exposition and Conference to be held in the municipal auditorium, Cleveland, Ohio, May 6-9, 1952. Drawings for booth locations in November allocated 123 spaces, leaving only 11 for later sale, according to S. R. Naysmith, chairman of the exposition operating committee.

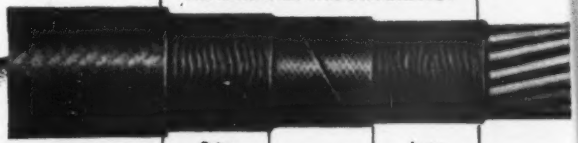
For Demonstrating Good Farm Wiring

For conducting practical demonstrations of good wiring practices and motor installations for the farmstead, a guide book has been prepared by the Farm Utilization Committee of the Edison Electric Institute. It is conceived primarily as an aid to teachers in vocational agricultural schools, 4-H Club instructors, leaders of youth organizations, and similar groups. The guide, "Farm Wiring Demonstrations for Group Presentation," explains in detail each step in the demonstrations, and the reasons governing the procedures.

Its five sections cover the basic principles of wiring circuits; principles of wiring switches; installing outlets and switches; selection, operation, and care of electric motors; and planning the farmstead wiring layout. Wiring boards upon which the various functions of electric equipment may be visualized are clearly illustrated with suggestions for their construction. The guide, 57 pages, in mimeographed

ROCKBESTOS A.V.C.® INSULATION ENABLES COPPER TO DO 60% MORE WORK THAN ORDINARY INSULATIONS

IT'S THE A.V.C. "SANDWICH" THAT MAKES THE DIFFERENCE



This "sandwich" protects the varnished cambric. It enables A.V.C. to carry more current than cables with conventional insulations.

Outer Felted Asbestos Wall	Varnished Cambric	Inner Felted Asbestos Wall

Chapter 10, Table 1 of the National Electric Code provides definite proof that high-rated Rockbestos A.V.C. carries more current . . . enables you to save critical copper and steel.

TABLE OF CURRENT CARRYING CAPACITIES
(Ambient Temperature 40°C — 104°F)

C M	TYPE AVA	TYPE RH
300000	**324**	251
350000	367	273
400000	395	295
500000	442	**334**

Hi ...Your best buy

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONN. *the originators of A.V.C.®*
New York • Cleveland • Detroit • Chicago • Pittsburgh • St. Louis
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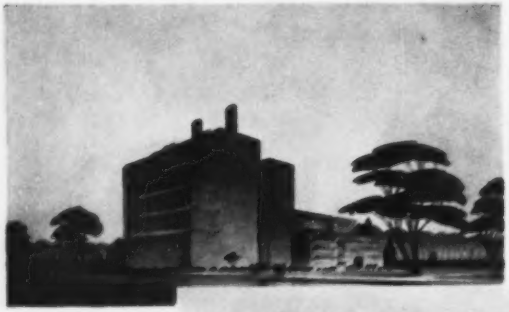
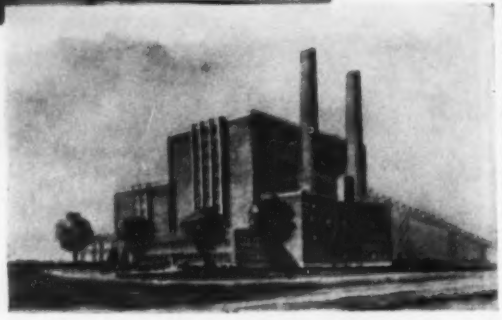
ON THESE TWO INSTALLATIONS

the AEROTEC SERIES

Assures 97.5% FLY ASH COLLECTION Efficiency



LEFT: The 264,000 kw (four units) J. Clark Keith Generating Station of The Hydro-Electric Power Commission of Ontario at Windsor, Canada. H. G. Acres & Co., Niagara Falls, Ontario, Consulting Engineers.



RIGHT: The 400,000 kw (four units) Richard L. Hearn Generating Station of The Hydro-Electric Power Commission of Ontario at Toronto, Canada. Stone & Webster Engineering Corp., Boston, Mass., Engineers and Constructors.

Here's on-the-job proof that Aerotec Series Mechanical-Electrical Dust Collectors are used for continuous efficiency. Guaranteed 97.5%, at normal full load the overall efficiency is anticipated as high as 99% at these two Canadian generating stations of The Hydro-Electric Power Commission of Ontario. Aerotec Series Collectors serving each plant combine a design 3RAS Mechanical and an Electrical Precipitator.

In the Mechanical unit, small diameter, permanent molded aluminum tubes provide high efficiency. Exclusive Aerotec pocket type collecting electrodes in the Electrical Precipitator reduce reentrainment of dust in the gas stream, contributing to a sharp improvement in stack appearance. The combined actions of these units assure maximum dust collection efficiency. Many Aerotec Series installations verify that fact.

Your plant can eliminate dust nuisances with Aerotec equipment just as many well-known companies have done. This highly successful performance is a reliable measure of Aerotec ability to solve your dust collection problems. Write our Project Engineers today!

Project Engineers

THE THERMIX CORPORATION

GREENWICH, CONNECTICUT

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THE AEROTEC CORPORATION

GREENWICH, CONN.

form, with six charts, may be obtained from the Commercial Division, Edison Electric Institute, 420 Lexington Avenue, New York at fifty cents per copy. Prices in quantity are available upon request.

New Street Lighting for Phoenix

Under provisions of a 20-year contract signed with the city, Central Arizona Light and Power Co. is spending $1,300,000 over a four year period to give Phoenix one of the finest modern street lighting systems in the nation.

The utility is installing the system and will operate and maintain it at an annual cost to the city of $254,000. When completed, it will include 5,496 lights for main and secondary business streets, arterials, and residential district. Before the utility started its modernization program, the city lighting system totaled approximately 1,900 lights.

Lamps will be hung 28 ft. high from 8-ft. upsweep brackets on aluminum and wood poles. On primary business and arterial streets 15,000 lumen lamps will be spaced 60 ft. apart with four lamps at intersections. Secondary traffic streets will be lighted with 10,000 lumen units on 75-ft. spacing. The wood poles will be used on residential streets, one 6000 lumen lamp at each intersection and one in the center of any block longer than 300 ft.

Training Home Economists

Launching an expanded home service program, The Coolerator Co held in December the first of a series of three-day factory training conferences for distributor home economists. Limited to groups of approximately twelve at a time, for more personalized instruction, the conferences included the introduction of the new Coolerator Home Service Manual, and outlined the expanded activities of this department as well as to train the home service directors on how to conduct demonstrations, training sessions, 4-H Club activities and other home service functions. The conferences were directed by H. C. Beresford, director of advertising and sales promotion, Mary Pennant, director of home economics, and N. C. Sabee, sales promotion manager.

Over 10,000 installed in one city... for good reason!

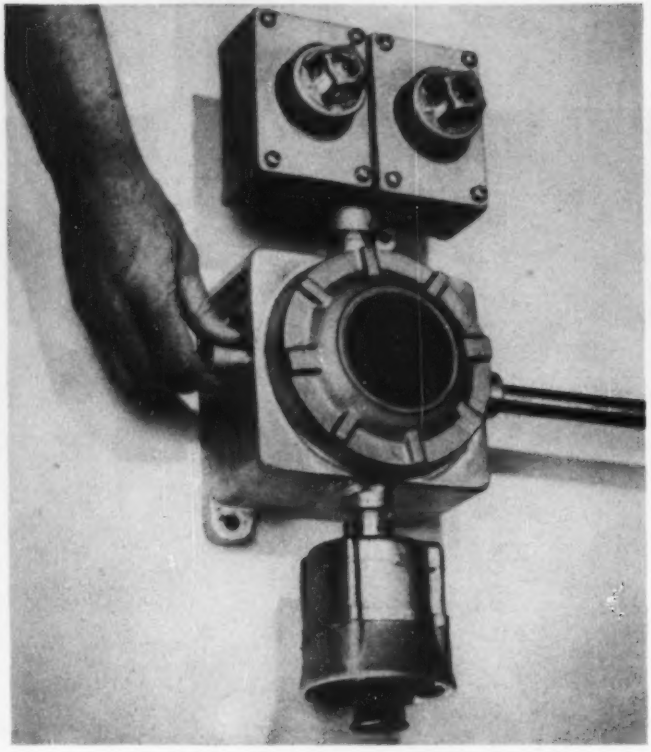
Installing a good street lighting system is only part of the job. Equally important is the maintenance of that system. For example, Cleveland gets these maintenance advantages by using the AK-10!

1. They save time on routine washing and relamping because of the automatic latch-on device. Maintenance is a speedy one-man operation.
2. They get longer reflector life because this is the heaviest aluminum reflector of any unit of its type available today. This provides greater mechanical strength and a better reflecting surface.
3. They get better maintained lumen efficiency throughout the life of the lamp, because this unit is 25% larger than other units and, therefore, has a lower operating temperature.

Check the standardized line of interchangeable street lighting units available at Westinghouse. Send today for B-4237, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE SURE... IF IT'S
Westinghouse
LIGHTING DIVISION
Edgewater Park, Cleveland

J-04501



Combustible Gas Alarm

Completely explosion proof, this new alarm can be installed directly in the suspected atmosphere, either indoors or out. Bell-shaped cover housing makes sensing unit weather proof.

Explosive vapors are signalled by a red indicator light or by remote alarm units as desired. Alarm point at 0.2 of the lower explosive limit is standard, but other values can be provided.

Ac operated, an electronic trigger-tube circuit converts sensing unit signals into alarm indications. Standby power consumption is 15w at 115v.

Completely ac operated, the Model EE alarm is designed for rough-service locations. It contains no meters or meter-type sensitive relays. The electronic chassis is designed for quick and easy removal so it can be replaced with a spare chassis and conveniently shop serviced. The single-knob control combines a turn-to-balance and a press-to-test function.

Features of the Model EE make it applicable to pipeline pumping stations, liquified-petroleum gas plants, and industrial and commercial areas where gas or volatile liquids are used, stored or handled.

Johnson-Williams Ltd, 2738 Third St, Palo Alto, Calif.

Longer Life for Welding Nozzle Tips

By adding a Carboloy cemented carbide bushing inside the conventional feed nozzle tip for automatic arc welding, General Electric at their Fort Wayne Works has increased life of the nozzle tips up to 20 times. It is claimed that wear is no longer a problem, and burning effect is greatly reduced.

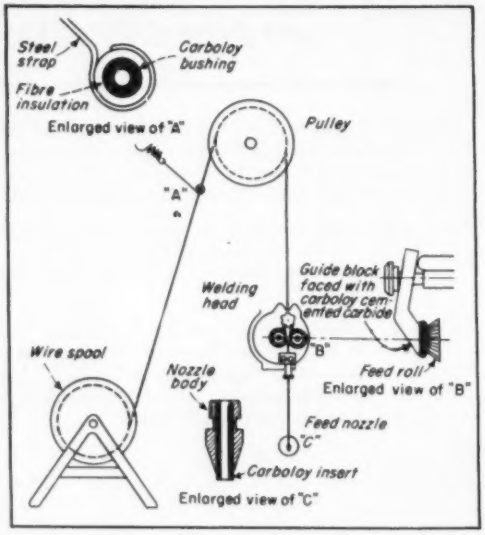
In one instance where coiled electrode wire is especially abrasive, brass nozzles had to be replaced 6 to 8 times per week. Carbide protected nozzles are giving a service life of 3 months or better. Also, it is claimed a more uniform narrow weld can now be maintained.

On other operations where former life had not exceeded three weeks, the carbide nozzles are now lasting as long as 12 months. In view of these several benefits, the use of carbide-equipped nozzle tips has been made standard on about twenty automatic arc-welding machines.

To reduce downtime and maintenance cost on arc welding equipment, a carbide guide ring, added inside the fibre guide which keeps the electrode wire from riding off the overhead pulley, eliminates short circuit danger.

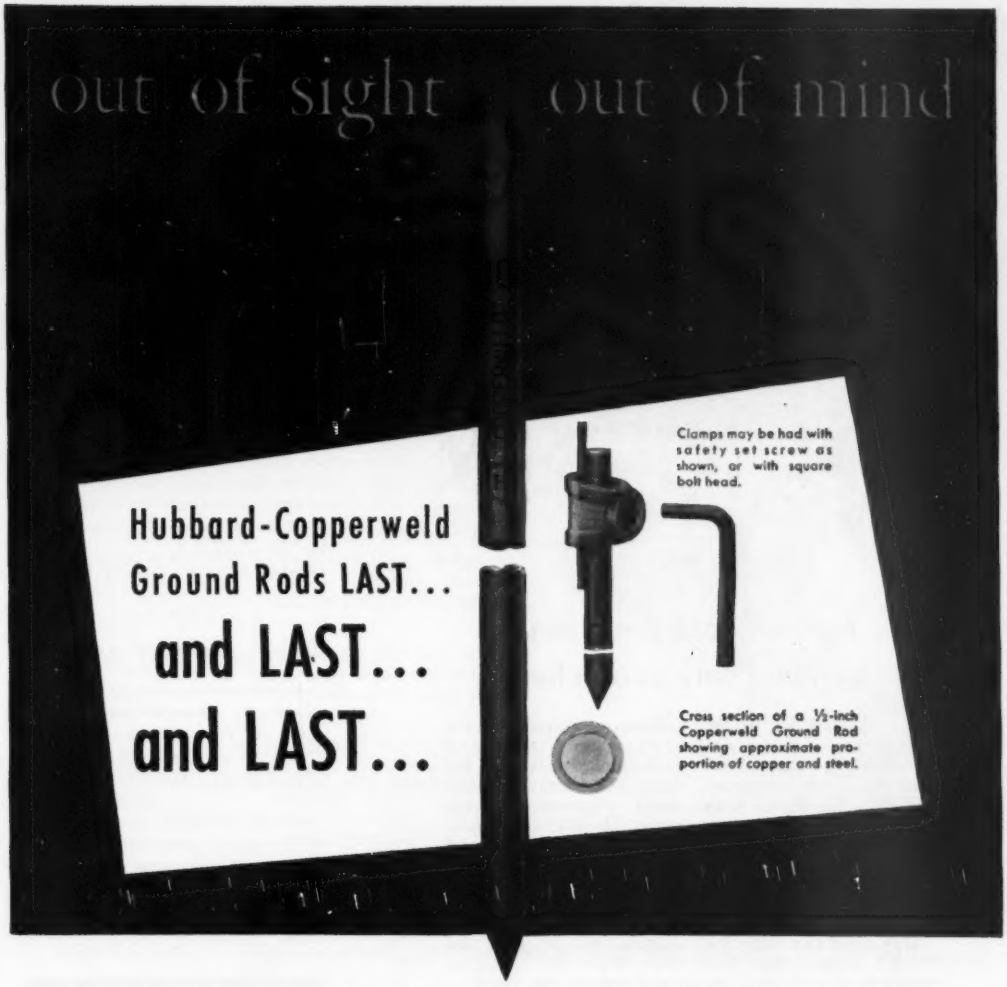
Short circuits had previously occurred when the wire wore through the fibre insulation and came into contact with the metal support arm.

Final application was at guide block which locks electrode wire in position against the conical feed rolls. Wear at this point previously impaired positive feeding.



To eliminate this condition the guide block is now tipped with a standard Carboloy cemented carbide blank.

Carboloy, Dept of General Electric Co, Detroit 32, Mich.


out of sight
out of mind
Hubbard-Copperweld
Ground Rods LAST...
and LAST...
and LAST...
Clamps may be had with safety set screw as shown, or with square bolt head.
Cross section of a ½-inch Copperweld Ground Rod showing approximate proportion of copper and steel.

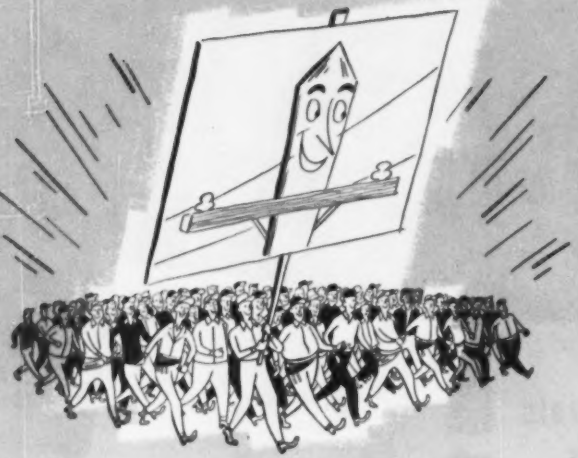
Installed underground, out of sight, for years and years to come. Out of mind, too; no more worries about protection. Periodic tests can be made quickly, easily.

Hubbard-Copperweld Ground Rods combine the strength of alloy steel with the permanent corrosion resistance of copper. The permanent Molten-Weld completely eliminates the possibility of harmful electro-galvanic action within the rod. There are no microscopic cracks, fissures, or pin holes in the thick copper exterior. They offer assured protection when installed to a sufficient depth to reach permanent moisture.

The time-tested dependability and economy of Hubbard-Copperweld Ground Rods have been proved in service for 35 years. They offer permanent grounding protection at lowest annual cost. They come in diameters from ⅜ to 1-inch and in lengths from 5 to 40 feet.

HUBBARD AND COMPANY
ESTABLISHED 1843
PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA
"Hang the Load on Hubbard Hardware!"

at the poles . . .



linemen vote for clean, certain Penta protection

When linemen go to the poles, they cast a rousing vote for PENTA. They know from their own experience that PENTA-treated poles are clean . . . easy on their clothes and body. They also know these poles are sound and safe . . . free from shell rot, top rot, ground line decay and insect damage.

Management votes for PENTA because they can absolutely depend on it to give poles long life and minimum maintenance. That's because PENTAchlorophenol is a powerful, stable and uniform wood preservative—gives measured and positive protection. It's always the same! Penetrates deeply and won't evaporate or wash away. Doesn't affect conductivity, creates no special problems.

Specify PENTA treatment for safeguarding your poles, cross-arms and other wood construction. It costs no more than other types of wood preservation. Write us for complete facts and the names of companies supplying PENTA-treated forest products.

CHAPMAN CHEMICAL COMPANY

Dermon Building, Memphis 3, Tenn.

333 N. Michigan Ave., Chicago 1, Ill.

CHAPMAN

Penta Preservative

It's Clean! It's Certain!

Conforming to A. W. P. A. Specifications P8-49 and P9-49

Circuit Breaker Line

Stub-lok circuit breakers are designed to provide circuit protection with a high measure of safety, dependability and service life, and to reduce the cost of circuit breaker equipment below the existing level.

The line has only nine enclosures. Most of the line can be either flush or surface-mounted.

Federal Electric Products Co, Newark, N. J.

•

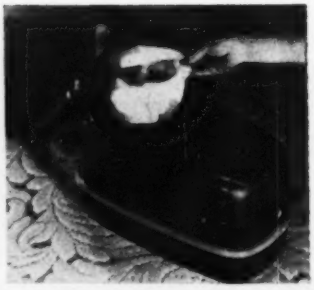
Attenuator Switches

A new line of attenuator switches includes 12 round, single-deck units in one and two pole types with up to 60 contact positions and with rotations ranging from 144 to 360 degrees.

All units are available with or without detent mechanism and have silver alloy contact wiper arms.

Shallcross Manufacturing Co, Collingdale, Pa.

•



One HP Vacuum Cleaner

The new Universal vacuum cleaner is claimed to have the most powerful unit yet put into a cleaner.

The vacuum cleaner operates on

(*Continued on page* 144)

JOB FINISHED?

Are You Sure?

You can be sure that the job is finished for good if you use Triangle — the *quality* wire, cable and conduit.

Today all electrical material *must be right!* Defense Plants particularly can't be allowed to slow down as a result of power failure.

Do it right the first time! Make sure the job is finished for good. Specify Triangle's Glazon Wire, Hot-Dipped Galvanized Conduit and other top quality Triangle products.

It costs no more to do the job with electrical material that is *right* from start to finish. Throughout both of Triangle's Plants you'll find this watchword:

"It Must Be Right"

When you specify Triangle, you can be sure *it is* right!

THIS MAN SAVES YOU MONEY!

He is your Triangle Distributor. He, and *all* electrical distributors, lower the cost of distribution of electrical equipment to you.

In the long run, you'll save and get it faster, from a Triangle Distributor.

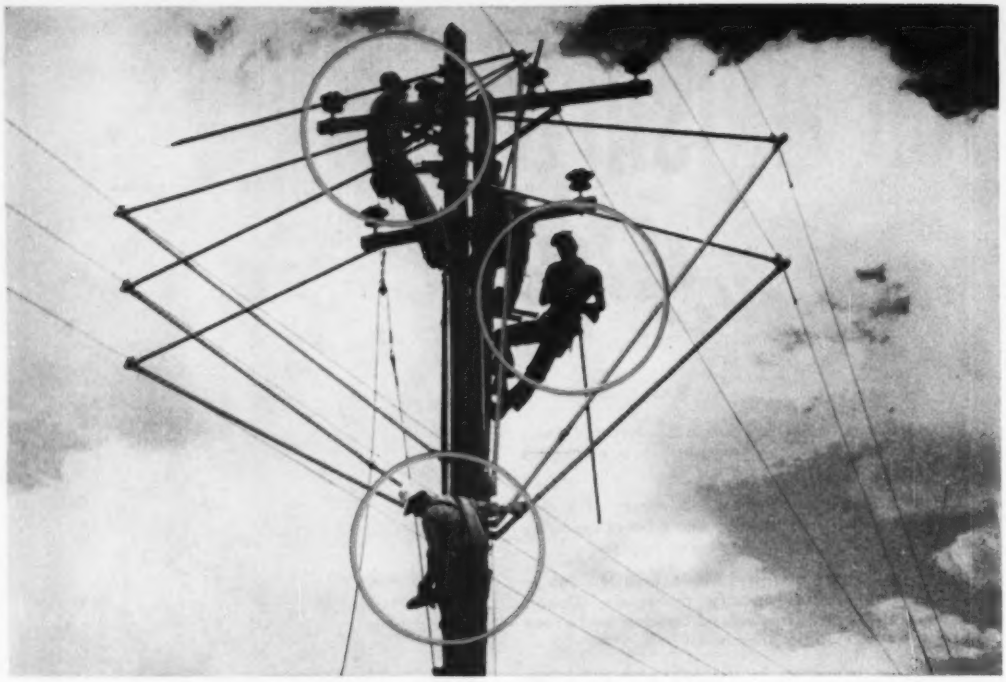
THE TRADE-MARK OF TOP QUALITY!

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

IT *MUST* BE RIGHT

"Glazon" Building Wire • Glazon Non-Metallic Sheathed Cable • Armored Cable • Service Entrance, Service Drop, Varnished Cambric Braided or Leaded Triplex Trench, Power and Parkway Cables • Bare Wire • Rigid Conduit Hot Dipped Galvanized • Electric Metallic Thin Wall Conduit • Flexible Steel Conduit



Their Lives Depend on the SAFETY of Their Tools...

There's nothing more important to hot stick crews than the safety of the tools they use. It's also important to safety directors, maintenance supervisors and, of course, to management that these tools be absolutely safe, that they are properly cared for and carefully inspected at periodic intervals.

Plastic coatings have helped to make hot sticks safer by protecting them from external damage. Now, a new tough transparent plastic protection called Chance "Maplac" also makes it possible to check the condition of the wood by visual inspection.

Chance "Maplac" Protected Tools are the result of more than five years of painstaking research. This brand-new coating process, developed jointly by Chance engineers and our plastic supplier, provides a crystal clear, extremely tough finish that resists surface abrasion; is unaffected by oil, grease, gasoline or salt water; that perfectly seals joints around metal fittings; that retains its toughness regardless of temperature variations and that can be readily repaired without tools or heat should the coating be cut by a sharp blow.

Chance "Maplac" protection fully meets the long established Chance standards for excellence in performance and safety to linemen. "There's nothing too good where life is at stake."

NOW... Plastic Protection at No Extra Cost!

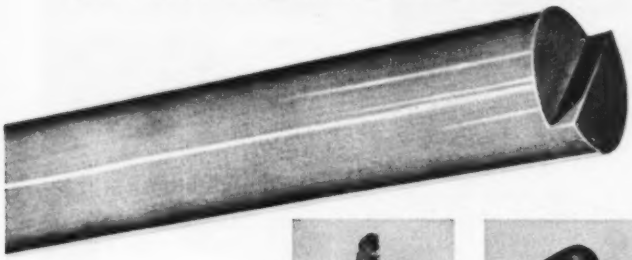
C53-4

CHANCE

MAPLAC*

Plastic Protected HOT LINE TOOLS

cut tool maintenance costs!



Poles are completely sealed up in this new plastic protection. Ends are sealed and joints around metal fittings are completely protected.

Now, Chance lightweight, aluminum-fitted Hot Line Tools are protected with a new super-tough plastic finish called "Maplac"* that greatly reduces tool maintenance and helps to keep tools in safe working condition.

This new plastic protection has many plus features of real value to hot stick users:

TOUGHNESS to withstand any impact or abrasive action encountered in normal use.

TRANSPARENCY that permits initial inspection and periodic checks.

MECHANICAL STRENGTH–Chance "Maplac," being extremely tough, does not require sacrifice of pole size and strength to gain the necessary thickness. It adheres to the wood surface and reinforces the pole adding to the factor of safety.

TEMPERATURE RESISTANCE–retains its toughness under widely varying temperatures.

ELECTRICAL RESISTIVITY– exceeds the voltage withstand tests of the wood insulation (complete safety, however, depends on the moisture content of the wood–no plastic will completely prevent absorption of moisture vapor).

MOISTURE RESISTANCE–Chance "Maplac" retards the absorption of atmospheric vapor in high humidity and protects the wood from precipitation moisture (this does not mean that plastic covered poles are recommended for use in the rain–but that Chance "Maplac" greatly reduces moisture penetration.

REPAIRABILITY–may be repaired without heat or special tools if cut by a sharp blow.

All this at NO INCREASE IN PRICE! Specify Chance "Maplac" Plastic Protected Tools.

* TRADE NAME

ABC INDUSTRIES

A·B·CHANCE CO·

CENTRALIA, MISSOURI

SAN FRANCISCO, CALIF.

Reprinted from "CHANCE TIPS"

Using hot sticks for the last thirteen years in forty-eight states and five Provinces of Canada has shown me the need for some good tough covering for these tools. We demonstrators try to set a good example in caring for tools by the way we handle them in use. We also carry them in trailers where we can take better care of them than you can by hauling them in bags or thrown loose on trucks. Even with the care we give them, it's almost impossible to keep from scarring these important tools in use or in hauling and storing them. We have to have our hot sticks refinished twice a year. This costs money even if it is a rainy day job with many of you.

About five years ago, I began putting the bite on our Research Department for something better. Since plastics were used in everything from toys to heavy machinery, we figured some type could be used on hot sticks. After a lot of arguments, experiments, tests and headaches, they now have me thoroughly convinced that "Maplac" is the answer.

I don't know what the stuff is, but it's tough, strong, light and looks good. It's clear as cellophane so you can see the grain of the wood and inspect the pole right through the plastic.

This Chance "Maplac" coating doesn't mean that hot sticks can now be thrown around in the truck or on the ground like a shovel or sledge hammer. They're tough but you still have to watch out for surface dirt or moisture.

Chance "Maplac," like any other plastic, will absorb moisture but this action is much slower on a "Maplac" covered pole than on the old-type stick treated with pole preservative. By the same token, it also takes longer to dry out the new pole. Our Engineering Department tells me there is nothing—even glass—that moisture won't eventually penetrate.

The biggest advantage of Chance "Maplac" protected tools is the saving in stick maintenance. Take the same care of these new sticks that you took with the old and your hot stick maintenance will come way down. Also you'll have sticks that always look good—sticks that men will be proud to use.

SEND FOR A SAMPLE

If you would like to inspect this new plastic protection, send us a postcard, or attach the coupon below to your letterhead.

A. B. CHANCE COMPANY, Centralia, Mo.
Please send a sample of your new plastic protection.

Name_____

Title_____

Company_____

Address_____

City_____ State_____

"No Use Going Out There
...THEY BURNED OUT LAST NIGHT!"

THAT'S BAD NEWS today when electrical equipment is so hard to replace. Bad news for management, too—especially if it has to explain why the fire protection it provided was too little or the wrong kind!

Too many utility fires result from failure to be ready for fire. In generators, transformers, switching equipment and other danger spots fire can hit like lightning, with crippling effect. Ordinary precautions and protection are often hopelessly inadequate!

When CARDOX originated "Low Pressure Carbon Dioxide Systems"* years ago the very first system went into a central station. Since then CARDOX Systems have been recognized as standard, required protection by many utility companies. Applying CARDOX CO_2 in any quantity, they hold fire damage to a minimum—and eliminate extinguishment damage entirely!

Your operations will be safer with CARDOX *protection.* A survey by CARDOX will show you how easily you can write off fire as a major threat. We'll arrange one if you'll kindly write us.

*Covered by Patents Issued & Pending

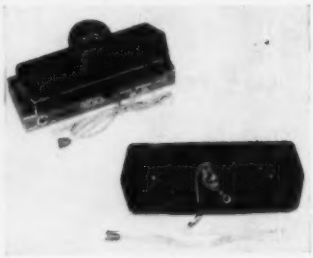
CARDOX
ORIGINATOR OF Low Pressure CO_2
FIRE EXTINGUISHING SYSTEMS

CARDOX CORPORATION • BELL BUILDING • CHICAGO 1, ILLINOIS
Offices in Principal Cities

115-v, either ac or dc with a power rating of 675w average. The horsepower rating is stated to be approximately 1 hp.

A double-load duty switch is designed for 12-amps load, yet the running current is 6.5 amps. Starting current is 13 amps ac, power factor is .97 and efficiency is 85-90%.
Landers, Fray and Clark, New Britain, Conn.

•

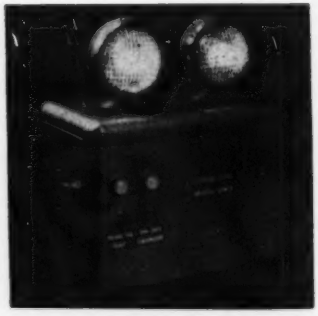


Nylon Pull Chain Ratchet

A nylon ratchet for pull chain sockets and lampholders has been announced.

New mechanism replaces conventional metal ratchet and eliminates possibility of electrical short through pull chain because of high dielectric qualities of nylon.
Monowatt, 95 Hathaway St, Providence, R.I.

•

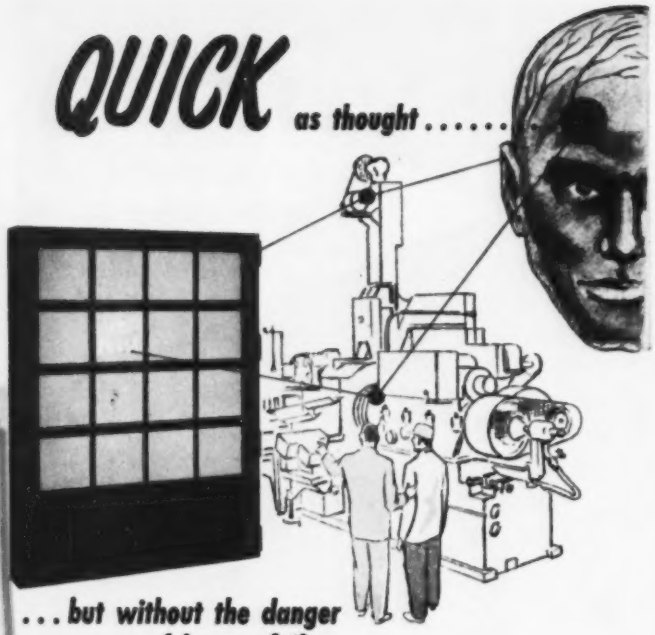


Emergency Lighting Unit

The Sentry-Lite is stated to be the only fully automatic and independent emergency lighting unit. It is designed to meet and fulfill any emergency lighting needs.

Unit plugs into any ordinary lighting outlet and functions automatically when power fails. It will illuminate 10,000 sq ft for a period of nine hours or more. When the power comes on

WHEN
PROTECTED BY
LIFE-SPAN
THEY'RE
SPANNED
FOR LIFE
LIFE-SPAN Western Red Cedar
Poles LAST LONGER!
Straight, strong, clear, lightweight Western Red Cedar Poles treated the LIFE-SPAN way, simply cannot be beat for pole line construction. Since the origin of the full length LIFE-SPAN treatment ten years ago, our chemical engineers have yet to find a single pole that shows sign of decay or failure of any kind.
LIFE-SPAN poles are cedar-clean and safe to work on. They build good public relations for the companies using them. Once installed they are set for many, many years of dependable pole line service. Before construction is begun get the facts, and you'll get LIFE-SPAN Western Red Cedar Poles. Write any of the firms listed below.
CONSOLIDATED TREATING CO.
MINNEAPOLIS, MINNESOTA
Life Span
Page & Hill, Inc.
Minneapolis, Minnesota
50 Church Street, New York, New York
B. J. Carney & Co.
Spokane—Minneapolis
Schaefer-Hitchcock Co.
Sandpoint, Idaho
(Suppliers for Joslyn Mfg. & Supply Co.)
Naugle Pole & Tie Corp.
Chicago, Illinois



AUTH

SUPERVISORY ANNUNCIATORS

provide audible and visible signals that

- **PROTECT YOUR EQUIPMENT**
- **SPEED YOUR PROCESS**
- **SAVE YOUR PRODUCT**

Dependable AUTH equipment prevents costly breakdown of vital services or expensive equipment by giving insistent visible and audible alarms of such conditions as overheated bearings, low fuel level, high cooling-water temperature, low or high pressure, end of a processing cycle, etc.

AUTH SUPERVISORY ANNUNCIATORS work this way:

when trouble occurs, a supervisory annunciator receives an electrical impulse from a normally open or normally closed, momentary or maintaining contactor, such as a thermostat, pressure or float switch. This impulse is converted in the annunciator circuit to a maintaining circuit that operates a visible signal indicating the source of trouble, and simultaneously sounds an audible alarm. Various operations sequences are available.

Write today for complete descriptive literature, without obligation!

SINCE 1892 AUTH

COMPLETE SYSTEMS • ONE RESPONSIBILITY

AUTH ELECTRIC COMPANY, INC.

34-20 45th St., Long Island City 1, N.Y.

MANUFACTURERS OF: Electrical Signaling, Communication and Protective Equipment for Housing, Hospitals, Schools, Offices, Ships, and Industry.

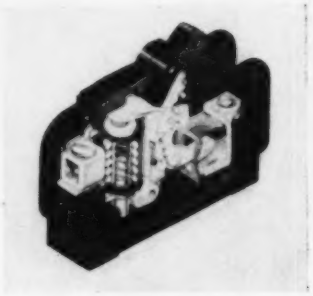
again the light starts to charge automatically.

Two adjustable beams provide illumination. Also incorporated are test lights and a switch and a charger light.

Light operates on 110v, 60 cycle circuits, and the battery only requires water every three months.

Hobby and Brown Electronic Corp, 55 Front St, Rockville Centre, N. Y.

•



Interchangeable Magnetic Breaker

A new design of the Magnette panelboard circuit breaker employs a fully magnetic operating principle. No thermal elements makes rating unaffected by room or internal panelboard temperature.

Time delay is provided on simple overloads, but at 10 times rated current it trips instantly.

Breaker is available in single pole units, 120v-15 to 60a or two pole units, 120/240v-15 to 35a.

Heinemann Electric Co, Trenton 2, N. J.

•

Feed-in Duct

Square D has introduced a new joint design in their Feed-in Duct. Installation time and effort are reduced.

Mating is not required to hang duct correctly, and only tie plates and nuts are needed to complete the joint.

(*Continued on page* 150)

The Control Center that OUTSMARTS ACCIDENTS

No longer is it necessary to expose personnel to "hot" buses or to sacrifice safety to gain accessibility to your control centers. Removal and replacement of Westinghouse Starter Units is safe and simple. "Magna-Grip" stab connectors simply "plug-in" to the power bus.

To work on the panel, starter unit may be withdrawn to a tilt-out disconnect position and locked. The unit is "dead" . . . completely disconnected from the power bus and self-supporting in this position. Protection is assured since it is impossible to reach around the starter unit and touch the bus.

For work on the bench, it is a simple matter to remove the complete starter unit. Note that the *unit door remains on the panel* so that it can be closed to guard the exposed bus. Rigid guide rails in the structure facilitate replacement of the starter unit. These rails align the starter and steer the "Magna-Grip" stab connectors into accurate contact with the power bus.

Westinghouse Control Centers offer still more points of safety.

For example:

Complete baffling to localize unusual arcing if faults occur.

Interrupting capacity of each starter not less than 15,000 rms amps.

Self-cooling construction for foolproof ventilation.

Sturdy structures that are self-supporting.

Get all the facts as presented in booklet B-4213 from Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-27008

DESIGN TESTED AND VERIFIED IN THE Westinghouse HIGH POWER LABORATORY

Westinghouse

CONTROL CENTERS

d-c power in 2 minutes with an

Practically instantaneous starting is one of the many advantages you get by using the I-T-E Mechanical Rectifier. This source of low-cost d-c power in the 50 to 400 volt range can be on the line, operating at full load, within 2 minutes of the time the starting button is pushed. Even less time is required if the rectifier is not used in parallel with other types of d-c sources.

There are only 5 quick steps to starting—4 to stopping the equipment. These are easily performed by unskilled labor.

I-T-E Mechanical Rectifiers have no large rotating masses which must be brought up to speed before going on the line. No warm-up period is required—no waiting for vacuum build-up. This means the I-T-E Mechanical Rectifier has maximum availability for your process.

For further information, write I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pennsylvania. Ask for Bulletin 5106.

The 10,000 ampere mechanism pictured will supply d-c power to a chlorine cell line.

INSTALLATION IS FAST, TOO!

A complete installation can be unloaded, installed and placed in operation in a relatively short time. This is possible because of:

- Packaged delivery.
- Factory-wired and labeled control circuits.
- Truck-mounted, movable rectifying units.
- Overhead bus (no trenches or basement preparation).
- Compactness of the design.

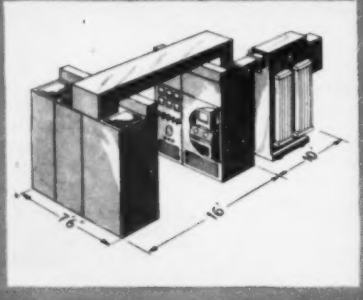
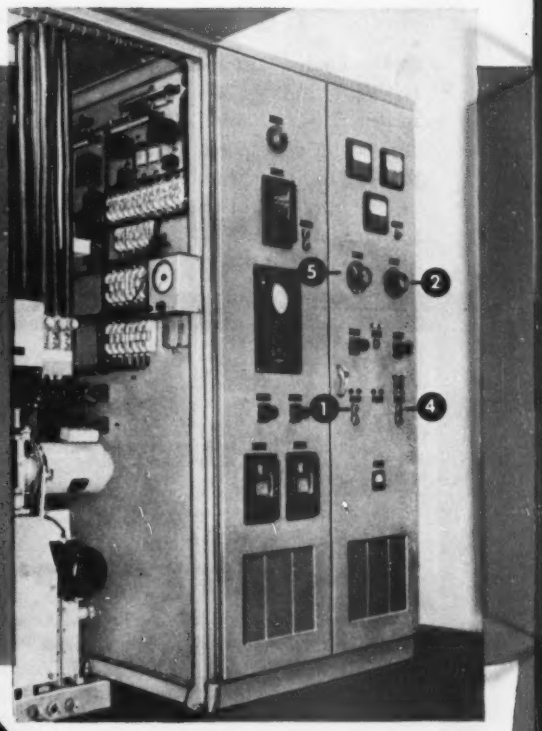


Diagram of typical mechanical rectifier installation. All elements of the unit including operating aisle are arranged in an area of 120 square feet. This does not include area occupied by transformer which is usually located outdoors.

I-T-E Mechanical Rectifier

All you do to start the
I-T-E MECHANICAL RECTIFIER

1. Push button to close a-c breaker.
2. Adjust d-c voltage to desired value.
3. Close d-c disconnect switch. (Not Shown)
4. Push button to close d-c breaker—you're on the line!
5. Adjust d-c current to desired value—automatic current regulator will hold that value—within ±1%!



I-T-E MECHANICAL RECTIFIERS OFFER THESE ADVANTAGES:

HIGH EFFICIENCY
96% or more in the 50 to 600 d-c voltage range.

SMALL SPACE REQUIREMENT
compact design, neat appearance.

LOW BUILDING INVESTMENT
no need for special foundation or unusual construction.

LOW INSTALLATION COST
put rectifier in place, connect, operate.

AVAILABILITY FOR SERVICE
no warming-up or speed-up period.

LOW MAINTENANCE COST
main contacts need only occasional replacement.

RUGGED TRANSFORMERS
conservative construction—latest design.

SIMPLE VOLTAGE CONTROL
voltage or current automatically controlled between ±1%.

MECHANICAL RECTIFIERS

I-T-E CIRCUIT BREAKER CO., 19th AND HAMILTON STS., PHILA. 30, PA.

R&IE EQUIPMENT DIVISION, GREENSBURG, PA.

CANADIAN MFG. AND SALES: EASTERN POWER DEVICES, LTD., TORONTO

EXPORT SALES: PHILIPS EXPORT CO., NEW YORK 17, NEW YORK

You can REDUCE equipment failure

● Use Electro Custom Processed Varnished Insulation to INCREASE LIFE EXPECTANCY and to *insure* the *safe, successful operation* of *electrical equipment.*

Selecting dependable insulation need not present any problem to design, insulation and maintenance engineers if they specify ELECTRO. Our method of processing produces varnished insulation with the ESSENTIAL SAFETY FACTORS.

You may buy with confidence when you buy these

ELECTRO

TECHNICAL PRODUCTS

- Silicone Varnished Fiberglas*
- Quin-Glas Hi-Temperature Insulation
- Varnished Fiberglas* Cloth
- Electro "300" Combination Slot Insulation
- Treated Asbestos Cloth & Paper
- Flexible Varnished Cambric Tape
- Varnished Condenser Paper
- Varnished Silk and Rayon
- Cable Wrapping Tapes

We invite you to use our Special Service facilities if you need varnished insulation to meet specific requirements. Write or phone Department E-1 for technical data and samples.

ELECTRO-TECHNICAL PRODUCTS

DIVISION OF SUN CHEMICAL CORPORATION

NUTLEY 10, NEW JERSEY

*T. M. Reg. U. S. Pat. Off. by Owens Corning Fiberglas Corp.

Features are low-voltage drop, totally enclosed construction, balanced voltage drop and high mechanical or dielectric strength.

Ducts available in 600 to 4000 amp capacities.

Square D Co, 6060 Rivard St, Detroit 11, Mich.

•

Gasoline Driven Arc Welder

A new gasoline engine driven arc welder features the control panel conveniently mounted on the end of the unit, at the generator end, for easier adjustment of the welding heat.

Control of the 1,000 combinations of welding current and open circuit voltage is accomplished by the large wheel and field rheostat.

Auxiliary power of 110v, 1-kw capacity is available through a standard outlet receptacle on the control panel.

Hobart Bros Co, Troy, Ohio.

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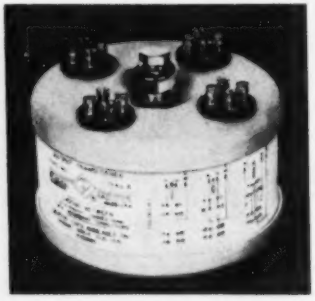


High-Power Toroidal Output Transformer

Excellent frequency response, low distortion, high power-handling capacity and flexibility of impedance ratios have been combined in the Type 942-A output transformer.

More Business for Y-O-U in '52

See how SYLVANIA backs up that profitable prediction with National Ads ... TV Programs ... Popular Premiums

All through this year, Sylvania will be sending business to your contractor customers (and naturally to you too) . . . when they display the Sylvania Qualified Lighting Contractor emblem.

Look at those powerful full-page ads. They're just part of the most dramatic and challenging lighting campaign ever run. They'll be seen by millions in *Time, Business Week* and other important magazines.

The big television show "Beat the Clock" will also display the Sylvania Qualified Lighting Contractor emblem. Hard-selling full-minute commercials will tell prospects why they should look for that sign on windows and trucks.

Sylvania Light Bulbs, too, will be backed by national advertising featuring another Sylvania premium offer.

And, continuing to build Sylvania's prestige, your customers will see great, smashing full-color ads in *The Saturday Evening Post, This Week,* and *American Weekly.* Make no mistake about it, there's big business for you in '52 . . . with Sylvania. Mail the coupon for full details NOW!

QUALIFIED
LIGHTING CONTRACTOR
SYLVANIA
SALES SERVICE

Urge Electrical Contractors to display this emblem *prominently!*

SYLVANIA

FLUORESCENT TUBES, SIGN TUBING, FIXTURES, WIRING DEVICES; LIGHT BULBS; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; PHOTOLAMPS; TELEVISION SETS

Sylvania Electric Products Inc.
1740 Broadway, Dept. L-3002, N. Y. 19, N. Y.
Please send me full details about Sylvania's big ad program for 1952.

Name_____

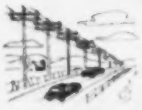
Company_____

Street_____

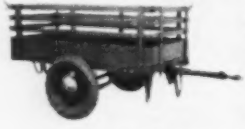
City_____ Zone____ State_____

HIGHWAY POLE TRAILERS

Strength for heavy loads— Economy handling for light loads



Here's one very versatile model from Highway's complete line of Utility Trailer Equipment and accessories. Its light weight means economy on average or light loads, its strength means it can carry the occasional heavy load of poles. Other hauling needs are cared for by its steel floor and optional side and end panels. Standard equipment includes a load binding winch mounted on rear cross member, a king pole binder on front cross member, and four cam lock sliding stanchions. Ask for our catalog for complete description and specifications.



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Light two-wheel units, sturdy in construction and especially designed for use with one-half ton trucks equipped with pick up bodies, installation or service bodies. Also hauls cross arms, insulators, wire, and pole line hardware—even brush.

Combination Pole and Cable Reel Trailer

Bolsters with sliding cam locking stanchions quickly mounted or unmounted. Cable reel saddles securely attachable at moment's notice. Handles cable as effectively as standard cable reel trailers. Quickly adjustable to different width reels.

Standard Cable Reel Trailer

For loading and transporting heavy and unwieldy reels of cable. Quick loading, with low center of gravity for safe transportation at high speeds. Saddle guides quickly adjustable to different width reels. Safety rope and attaching parts are standard equipment.

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Eighteen impedance ratios can be obtained over a wide range of values. Transformer has a continuous power rating of 90 w, and can handle peak powers of over 100 w.

General Radio Co, 275 Massachusetts Ave, Cambridge 39, Mass.

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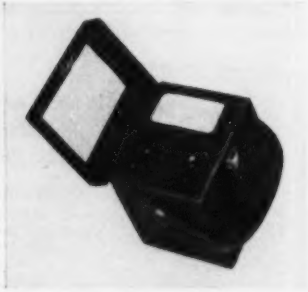

Precision Ohmmeters

ARI precision ohmmeters, models 244A and 246A, feature a compensating circuit for changes in internal resistance of batteries, compensation for lead and clip resistance and accuracy to plus or minus 1/32 in. at any point on scale or ½% at center scale.

Two No 6 standard dry cells are used. Instrument weight is 11¼ lbs.

Associated Research, Inc, 3760 W Belmont Ave, Chicago 18, Ill.

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Soil Compacter

This portable gasoline rammer is particularly suited for tamping fill or back-fill in restricted areas.

Rammers have produced 97.5% compaction with two passes on 10-in. lifts and averaged 200 cu yds, com-

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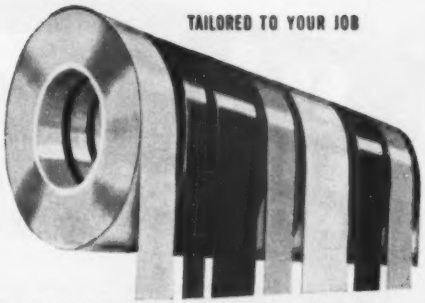

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- Polyken No. 822 is the only successfully oriented polyethylene tape with a pressure-sensitive adhesive.
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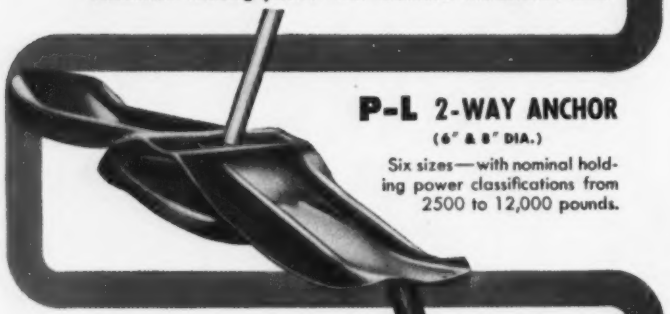

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(10" dia.—effective area expanded, 200 square inches.)
One size for transmission and heavy distribution lines with nominal holding power classification of 20,000 pounds.

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pacted measure, per 9-hr shift per rammer.
Barco Mfg Co, 1801-1815 Winnemac Ave, Chicago 40, Ill.

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DC Insulation Test Unit

This new high voltage dc insulation test unit with a wide range has been developed. Reportedly, this instrument is preventing insulation breakdowns on all types of high voltage equipment by detecting insulation weaknesses before breakdown can occur.

The instrument tests at over or under the full operating voltage and will not impair the value of the insulation as a result of the test.

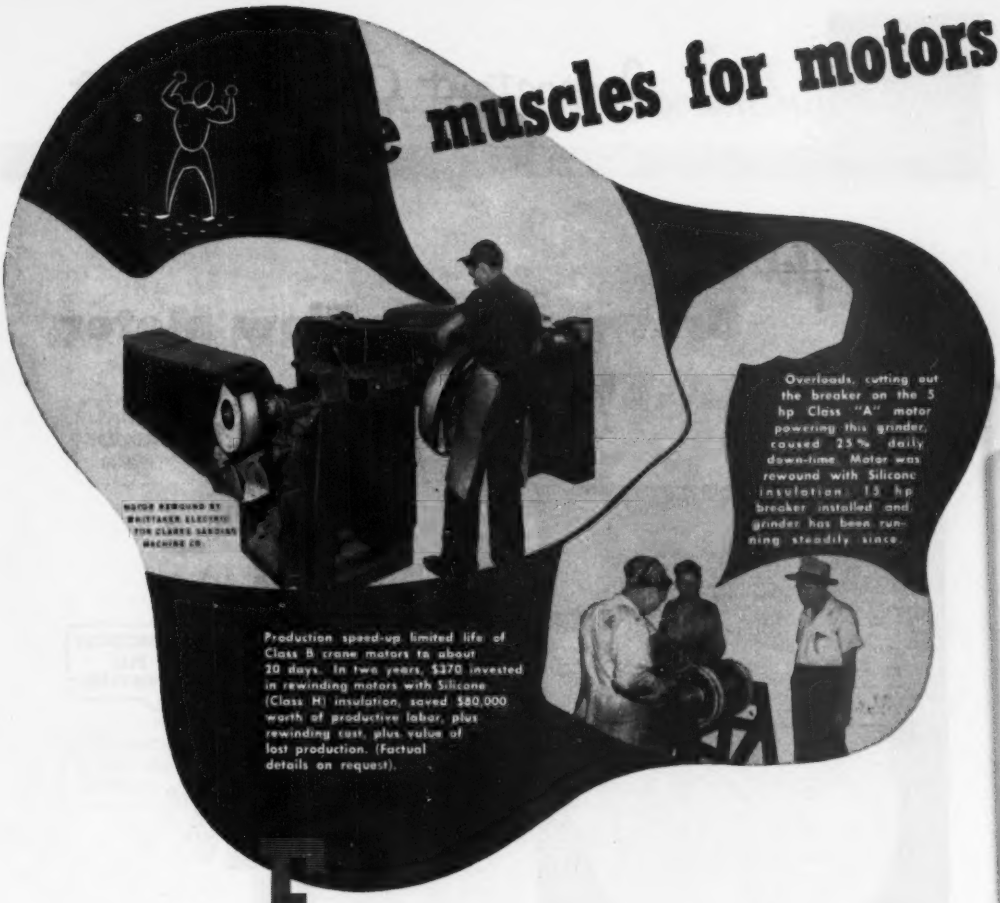
Called the TAKK high voltage dc insulation tester, the unit is applicable for ranges of 0-15 kv, 30 kv, 45 kv and 75 kv. Unit is portable, rugged and very accurate.
The John Hewson Co, 106 Water St, New York 5, N. Y.

MORE NEW PRODUCTS
about which you should know

General Scientific Equipment Co, 2700 W. Huntingdon St, Philadelphia 32, Pa. announces a new **automatic emergency light** for use when regular power fails. A standard 6 or 7½-v battery operates this 21 candlepower lamp. . . . Essex Wire Corp, Logansport, Ind. has developed **a magnetic starter of the line voltage type.** Overload relay features visible palladium-silver snap-action contacts. Expanding U-shaped bi-metal and snap-action contact provides motor overload protection.

A. L. Okum Co, 148-26 58 Ave, Flushing 55, N. Y. announces a **mastic filler material** for blowholes, casting fractures and pattern fractures that can be applied with a putty knife. Powdered aluminum in a quick-dry non-soluble liquid vehicle is the new material. . . . The Elwell-Parker Electric Co, 4205 St. Clair Ave, Cleveland, Ohio offers an **electric powered mobile crane** that features a telescoping boom. Crane capacity is 10,000 lbs at 5½ ft radius. Boom provides lengths of from 12 to 19 ft. Truck turns in 95 in. intersecting aisles, and maximum slew is 296 deg.

muscles for motors


Overloads, cutting out the breaker on the 5 hp Class "A" motor powering this grinder, caused 25% daily down-time. Motor was rewound with Silicone insulation; 15 hp breaker installed and grinder has been running steadily since.
Production speed-up limited life of Class B crane motors to about 20 days. In two years, $370 invested in rewinding motors with Silicone (Class H) insulation, saved $80,000 worth of productive labor, plus rewinding cost, plus value of lost production. (Factual details on request).

ELECTRICAL Engineers and Production Men can save thousands of dollars* by using Dow Corning Silicone (Class H) Insulation to up-rate standard frame motors of all sizes. Class H Insulation permits higher operating temperatures and heavy overloads for sustained periods, at the same time multiplying motor life—reliability—overload capacity—moisture resistance—and productivity.

Furthermore, at name plate rating, there is no appreciable difference in power factor and efficiency between a Silicone insulated and a Class "A" insulated motor.

If speeded up production schedules are one of your problems, why not add more muscle to your motors by changing over to Class "H" insulated equipment? Most of the leading rewind shops now offer Class "H" Insulation made with Dow Corning Silicones. Talk to the people who rebuild your motors — or call our nearest branch office. There's a specialist in Silicone Insulation there to help you.

*WANT PROOF? *Write for Dow Corning Data Sheet* AY-14

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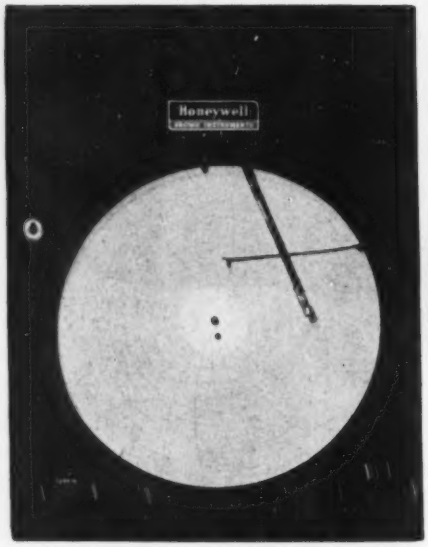
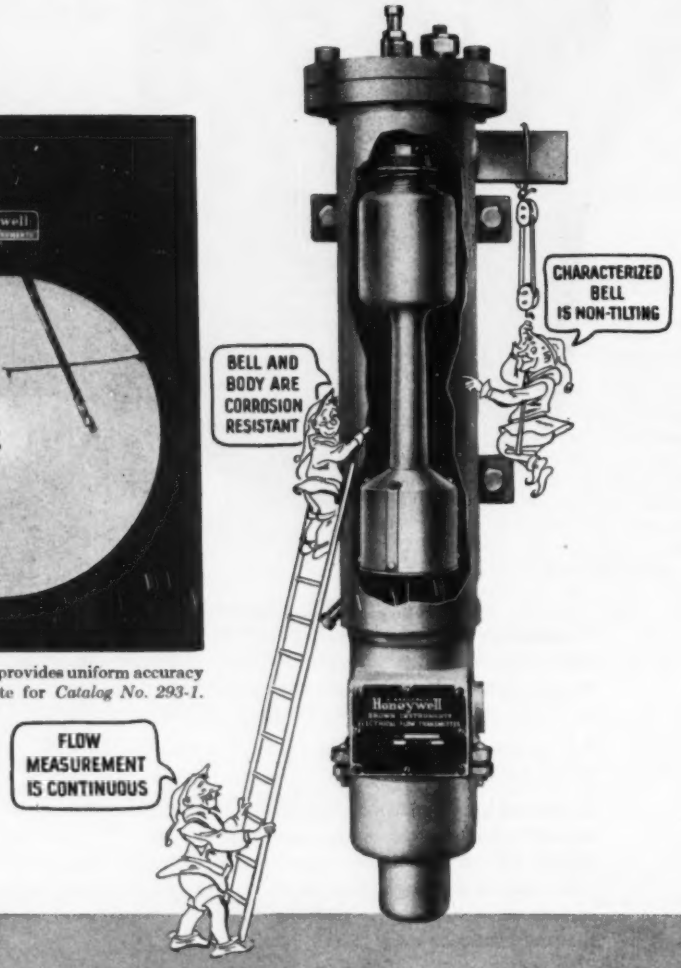
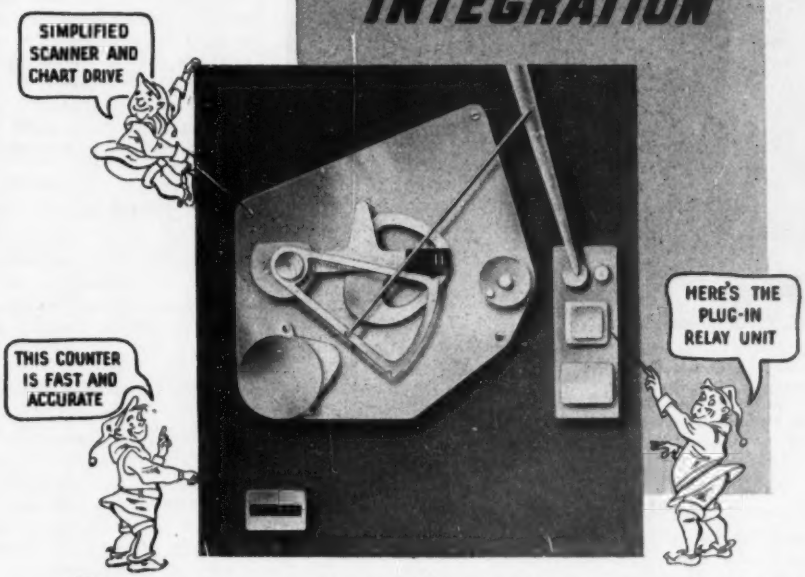
The Brown Electric Flow Meter



EVENLY DIVIDED CHART... provides uniform accuracy for all rates of flow. Write for *Catalog No. 293-1.*



incorporates . . . ELECTRONIC INTEGRATION



Two important features...evenly divided chart and electronic integration...facilitate flow cost accounting; eliminate intermittent measurement and slow, complicated totalizing.

The electronic integrator, consisting of but three major parts, simplifies accessibility and maintenance . . . permits quick checking and calibration. Scanning is rapid and extremely simple. The corrosion resistant meter body is of tubular construction, reducing weight and bulk. Transmission is electric. Mechanical flow meters, evenly graduated and similar to that shown, but with the bell directly coupled to the recorder pen are also available. Recorder is fast, chart is easily read under all conditions of flow. The characterized bell is corrosion resistant, too, and is specially designed to eliminate tilting.

Call in our local engineering representative for a discussion of your application.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4568 Wayne Ave., Philadelphia 44, Pa.

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BROWN INSTRUMENTS

First in Controls

● *Important Reference Data*

Write for a copy of Catalog No. 283-1, "Evenly Graduated Flow Meters" . . . and Bulletin No. 90-2, "Supervisory Instruments for Power Generation."

Better light in the nation's capital!

AMPLEX STREET LIGHTING LAMPS

Amplex Street Lighting Lamps bring improved lighting on Constitution Ave. (above) and on approach to So. Capital St. Bridge (right). Installation made by Potomac Electric Power Company.

FROM ONE COAST TO THE OTHER, Amplex Street Lighting Lamps are the fastest-growing choice of cities and utilities. Experience shows that these lamps give outstandingly superior service . . . and so they should! They're designed and premium-built to withstand the vibration and jolts of fast-moving traffic . . . to burn longer and to maintain their high light output.

In the Amplex line there's a street lighting lamp of the right type and wattage for every purpose. And for truly maximum life and dependability there's nothing equal to Amplex *Weatherproof Bulbs*. They're made of moisture-resistant "hard glass" that survives the severest climatic conditions and cuts service costs to new lows.

It will pay you to get all the facts about Amplex Street Lighting Lamps. Just write **Amplex Corporation, Dept. J-2, 111 Water St., Brooklyn 1, N. Y.**

AMPLEX

Sealed-Beam Reflector Lamps, Colorbeam Lamps, Spotlites and Floodlites, Industrial Infra-Red Heat Lamps, Vibration and Rough Service Lamps, Street Lighting Lamps, Traffic Signal Lamps, Incandescent Lamps, Fluorescent Tubes, Display Accessories.

WHAT THEY'RE SAYING

At Industry Meetings

Industrial Relations

Discussions at New Orleans Conference of SEE, EEI and Southwestern Personnel Group.

F. L. LARKIN, vice president, Wisconsin Electric Co

We are in that period of industrial history in which a new ingredient has been added to the list of qualities that adds up to successful management—an ingredient which is difficult to inject into an employee by training unless he has the proper personality basis for it. This ability, sometimes called "intellectual leadership" is that of being a successful leader in the area of labor relations and public relations.

HUGH C. THUERK, president, New Jersey Power & Light Co

I hope the utility executive program at the University of Michigan will become a valuable and recognized tool for developing tomorrow executives.

C. B. BOULET, personnel director, Wisconsin Public Service Corp

Recent surveys representing about 34,000 public utility employees showed about 25% lean toward government on matters such as competition with private utilities, control of wages and policies, and government in business. In addition, 17% had no opinion. Four out of every ten employees are either uninformed or misinformed regarding the fundamentals of the business system as it applies to public utilities.

R. G. KENYON, vice president, Southern California Edison Co

Line organizations must sell the management's point of view if a company is to survive. Companies must make full use of bulletin boards, house organs, and annual reports to employees to get their stories across.

F. E. VERDIN, director of personnel, Cleveland Electric Illuminating Co

About 85% of the top utility executives are 50 years or older with the average age about 60. The retirement rate during the next 15 years will be

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A De Laval Insulating Oil Purifier provides the means of maintaining a high dielectric that is safer . . . more reliable . . . economical. In the bowl of a De Laval Oil Purifier, water is continuously removed by means of centrifugal force and discharged to waste. Since the water goes down the sewer, it can never recontaminate the oil. There is no danger that a batch of oil in the process of purification will go in an instant from a high to a low dielectric test.

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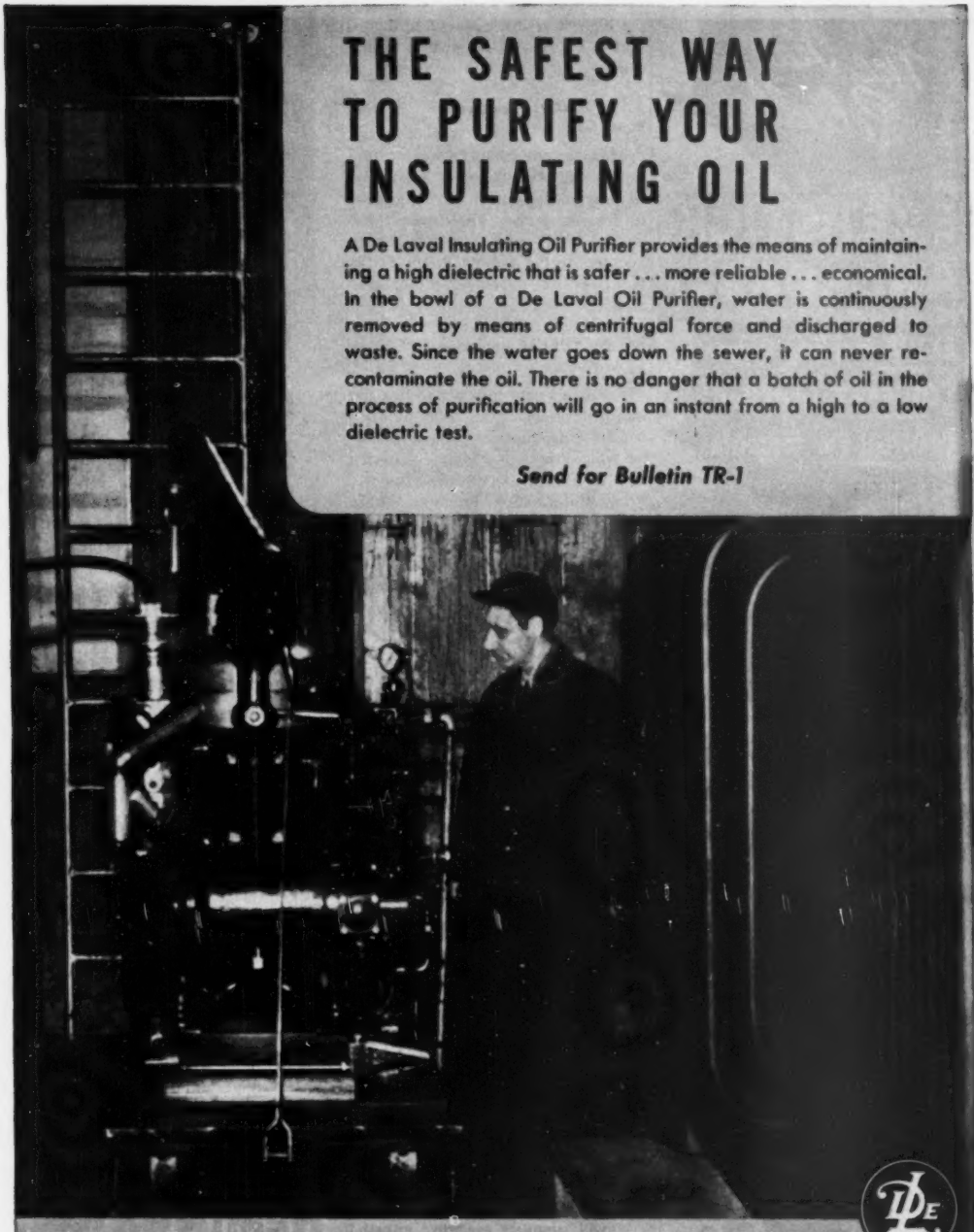

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● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE
EVERSTICK
FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

the highest in the business' history—during a period of its greatest expansion.

J. S. GRACY, vice president, Florida Power Co

Management should provide the setting and atmosphere of good relations by putting human relations ahead of everything else. The slogan "Men dealing fairly with men" has been adopted by the Florida Power Co as the basis for its employer-employee relations slogan.

W. O. TURNER, president, Louisiana Power & Light Co

Companies not now supporting the industry organizations Edison Electric Institute, Electric Companies Advertising Program, National Association of Electric Companies and the Public Information Program should join these organizations. Not only should financial support be given, but an active part in their work and proceedings should be taken. A united front will make our industry much stronger.

K. B. BERNHARDT, manager executive development, Monsanto Chemical Co

Experience is still the best teacher. Men must be helped to recognize the attitude with which they approach experience in order to ask intelligent questions and become better observers of their experience.

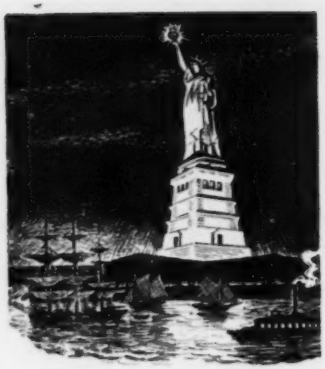
Management Executive Development

Burleigh B. Gardner, *executive director Social Research, Inc, before American Gas Assoc convention, St. Louis, Mo.*

The survival of many organizations, and even our free enterprise system depends on the creative leadership of our executives. This real creative talent must be sought and developed.

For an organization to develop real executives to fill future needs, the following things must be examined:

1. Does the organization provide the kind of atmosphere which will stimulate executive growth within the company?
2. What kind of executive talent is needed?
3. Is there any undeveloped talent within the company?
4. What kind of training or development is needed?



Light for Miss Liberty

New York Harbor's most famous resident was dedicated on October 28, 1886. The first floodlighting was in 1885 by the use of arc lights. In 1892, as part of the Columbian celebration, more lighting with incandescent lamps was installed.

Hemingray's experience in designing and manufacturing pole-line insulators started sixteen years before the dedication of the Statue of Liberty. It was natural, then, that with the coming of electricity that Hemingray should apply its knowledge and experience to the manufacture of electrical insulators.

Continuously since that time, constant research and testing, careful quality control and thorough individual inspection have made the name Hemingray synonymous with leadership and progress in glass insulator manufacture.

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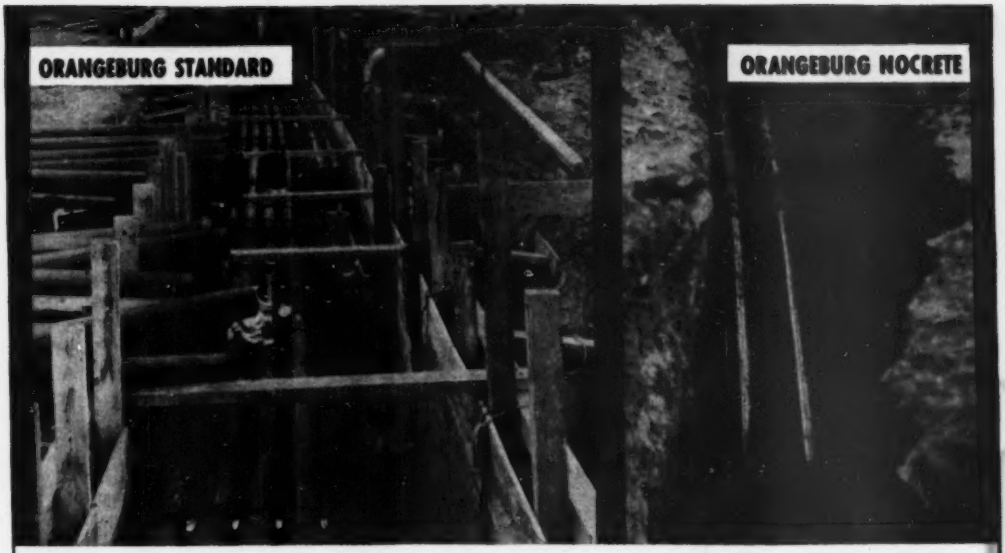

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STANDARD *installed with Concrete* · **NOCRETE** *installed without Concrete*

During the past 58 years—an era of great expansion for the Electrical Industry—Orangeburg Conduit has provided constant protection for the vital cables through which utility companies supply the life fluid of modern illumination, heat and power for modern homes, offices, factories and farms.

This record of 58 years underground pays tribute to the uniquely tough, strong, resistant materials of which Orangeburg Conduit is made . . . and their capacity to withstand corrosive ground waters and chemical wastes permanently.

Also important to utility companies is the fact that Orangeburg Conduit is easy to handle, transport, install . . . low in initial costs.

For more complete information write today to Dept. EW-2 for Orangeburg Catalog No. 51. Keep it ready for reference in your files.

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TIME-TESTED ADVANTAGES

- Impermeable wall and tight joints prevent corrosive ground waters from entering
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- Low coefficient of friction minimizes pulling tensions on cables. Protects cable sheath from abrasion when pulled in — also from wear during cable movement resulting from alternate expansion and contraction with changing loads
- Resists acids, alkalis, grease, oil
- Light, easy to handle and tool on the job
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NEWS ABOUT PEOPLE

G. A. PORTER H. P. SEELYE W. W. WILLIAMS

Detroit Edison Sets Up 3 Posts

Porter, Seelye, and Williams are named to managerial positions. Utility reassigns others and revises titles

Detroit Edison has created three new managerial posts to lighten and eventually carry most of the executive duties now being borne by Paul W. Thompson, vice president in charge of engineering. Thompson will reach retirement age at the end of this year.

George A. Porter, chief engineer of power plants, has been named manager of construction. He will assume managerial responsibility for the company's broad construction program, which includes the building of major new generating facilities.

Howard P. Seelye, chief engineer of the Engineering Department, has been appointed manager of engineering. He will be responsible for the utility's system engineering and long-range planning of facilities.

William W. Williams, chief engineer of lines, has been made manager of operations, with responsibility over the electrical system, overhead and underground lines, power plants, research, motor transportation, and central heating department operations.

All three of the new managers will report to Thompson.

Successors Named . . . Henry E. Macomber succeeds Porter as chief engineer of power plants. He was formerly assistant chief engineer of the department. Edward R. Moore, assistant chief engineer of the Engineering Department, succeeds Seelye as chief engineer.

Porter joined Detroit Edison in 1925. After serving in various engineering posts he was made assistant chief engineer of power plants in 1947 and chief engineer of power plants in 1949.

Seelye started with the utility in 1916. He was made senior electrical engineer in charge of the electrical section of the engineering division in 1937. He became chief engineer of the Engineering Department in 1949.

Williams, who began with Detroit Edison in 1921, has served as superintendent of motor transportation and supervisor of lines and transportation.

Others Advance . . . With the creation of the new managerial posts, other promotions and assignments have arisen.

In the Production Department, Robert M. Van Duzer, operating engineer of power plants, has been made assistant chief engineer of power plants. William W. Brown, mechanical engineer of power plants, has been assigned the additional duties of coordination of major new construction projects. Harold C. Reasoner, production load scheduling engineer, has been made operating engineer of power plants. John D. Starkweather, assistant production load scheduling engineer, has been made production load scheduling engineer succeeding Reasoner.

In the Engineering Department, Harvey A. Wagner, chief mechanical engineer, has been given the additional appointment as assistant chief engineer of the department.

Albert C. Pasini, superintendent of the company's Conners Creek Power Plant, has been appointed superintendent of the new St. Clair Power Plant now under construction north of Marine City. Lee W. Sparling was named assistant superintendent of the new plant.

To succeed Pasini, Raymond B. Harris was named superintendent at the Conners Creek plant. John R. Hamann was made assistant superintendent of the plant.

Staff engineer Arthur Griswold was appointed assistant to the president of Detroit Edison.

Additional Changes . . . Detroit Edison's Research Department has been renamed the Engineering Laboratory and Research Department. Claire H. Fellows, acting director, was promoted to director of the Engineering Laboratory and Research Department.

Several changes of title were announced, "to more correctly define the duties and responsibilities of the individuals concerned." Edwin O. George, former commercial manager, was appointed manager of sales. Thomas J. Peterson and Howard R. Stevenson, former assistant commercial managers, were named assistant managers of sales.

Chester F. Ogden, purchasing agent, was appointed manager of purchases and Donald F. Kigar was appointed assistant manager of purchases. Emil A. Jonas and Vincent A. Stace were named assistants to the manager of purchases.

Harvey E. Bumgardner, supervisor of Detroit Edison's library, was assigned as coordinator of technical assistance programs for foreign visitors to the company.

Max H. Harrington was appointed engineer in charge of the construction engineering—steel division of the Construction Department. He succeeds Guy F. Allen, who is retiring after 35 years with the company.

•

J. P. Jones has been named regional engineer in technical charge of design and construction activities for the Bureau of Reclamation's Region III, which includes southern California, southern Nevada, and most of Arizona. Jones, who was appointed acting regional engineer last October, succeeds C. A. Bissell who retired in

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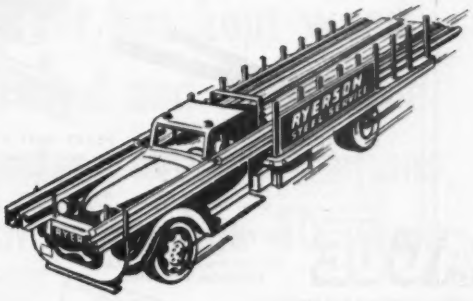
Every kind of steel is on hand for quick delivery. Though stocks are currently unbalanced, most requirements are usually available.



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PRINCIPAL PRODUCTS

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PLATES—Many types including Inland 4-Way Safety Plate
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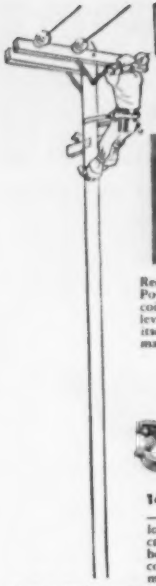

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COLLAPSIBLE REEL

Saves Time • Man-Hours • Material

Reel up wire — quickly and neatly — with the Eagle Type CR Collapsible Power Reel. Attaches to winch shaft with bayonet-type socket. Easy removal of coiled wire by collapsing holding arms of reel by a quarter turn of a convenient lever; a few turns of lever again expands reel. A useful accessory that pays for itself in materials and man-hours saved. Weighing only 75 lbs., the reel is made of aluminum alloy and steel, combining strength with light weight.

1417 PINTLE HOOK

— designed for heavy duty. Positive lock type latch. Easy to install on rear cross member of truck with only 7 bolts. Weight 48 lbs. Furnished with complete braces, bolts, and nuts for mounting.

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For use with 3 and 5 ton pole trailers. Has coupling eyes to fit standard pintle or towing hooks. Length 50 inches; width 3 inches. Tighteners 8 inches apart. Weight 55 lbs.

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National is the complete source for all your insulation needs. The National Insulation Catalog-Price List, which covers almost every conceivable product used in the insulation field, is reissued often, with up-to-the-minute listings and prices. Mica products, tapes, varnished fabrics, papers and fibres, sleevings and tubings, solders and fluxes, laminates, cements, and dozens upon dozens of other items. Easy to find under general headings together with their price and stock number. If you use electric insulation, this catalog is a downright necessity. Get your free copy now.

Special shapes and non-standard insulation items are quickly available on inquiry.

NATIONAL ELECTRIC COIL COMPANY
COLUMBUS 16, OHIO, U. S. A.

September. The new regional engineer started with the bureau in 1927 and has served as Bissell's assistant since 1945.

•

Guy Is Elected a VP by Watershed Council

David J. Guy, former manager of the Natural Resources Department of the United States Chamber of Commerce, has been elected executive vice president of the American Watershed Council, Inc, national association

D. J. GUY

of local, state, and regional watershed organizations. In his new post, Guy will be responsible for the development of the council's program of accelerated flood control and water resources development at the local and regional levels.

Guy joined the Chamber of Commerce in 1927 and was manager of its Natural Resources Department until his retirement last November. Previously he worked with the Geological Survey on water power investigations and land classification and with the Federal Power Commission on hydroelectric power investigations.

•

Louis H. Albee has been appointed manager of advertising and sales promotion for the Rocky Mountain district of General Electric Co's Apparatus Sales Division. He will be located at district headquarters in Denver. Albee, who has been a sales assistant in the Industrial Division at Denver since early in 1951, joined GE in 1941.

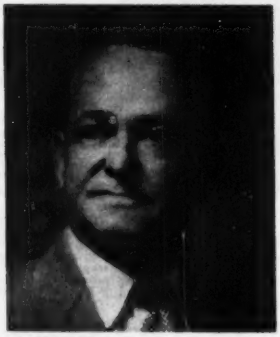
William E. Ruder has retired from General Electric Co's Research Laboratory after more than 44 year's service. Ruder, an electrical engineer,

has been serving as manager of the laboratorys' Metallurgy Research Department since 1938.

•

Central P&L Appoints Lovelady Chief Engineer

M. H. Lovelady has been appointed chief engineer of Central Power & Light Co. The former assistant chief engineer succeeds J. T. Persons, who has relinquished his duties as chief engineer upon reaching the retirement



M. H. LOVELADY

age Persons, however, will continue his other duties as vice president and director of the company.

T. E. Mansfield, formerly transmission engineer, has been promoted to assistant chief engineer replacing Lovelady.

Lovelady was employed by Texas Power & Light Co in Dallas before joining Central P&L in 1926 at San Antonio. He served in that location as a design engineer and tranmission engineer until 1938 when he was transferred to Corpus Christi as an electrical engineer. He was made assistant chief engineer in 1943.

Mansfield joined the utility in 1947 as a transmission engineer at Corpus Christi. Prior to this he was associated with Oklahoma Power & Water Co at Sand Springs as vice president in charge of electric and water operations.

Persons has served as vice president of the company since 1941. Before this appointment he was chief electric and water engineer, heading the engineering department for 14 years.

•

Lewis Gordon has been appointed managing director of the International Division of Sylvania Electric Products, Inc. His appointment coincides with

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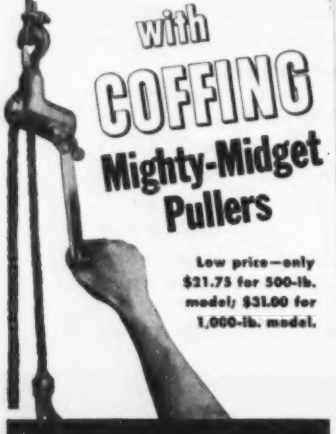
RAISE LABOR EFFICIENCY

The Mighty-Midget is a valuable extra hand on line work as well as for indoor installations. Weighing only 6½ lb., it hangs lightly on a tool belt, yet its 500-lb. capacity enables one man to do the lifting, holding, stretching work of many. (1,000-lb. model weighs but 9½ lb.)

LOWER OPERATING COSTS

Skilled hands go farther, too, for the Mighty-Midget Puller relieves the burden of countless lifting jobs . . . eliminates the necessity of calling highly paid specialists from their work to lend a hand.

Write for Bulletin E2MP.



with COFFING Mighty-Midget Pullers

Low price—only $21.75 for 500-lb. model; $31.00 for 1,000-lb. model.

COFFING HOIST COMPANY
Danville, Illinois

Quik-Lift Electric Hoists • Hoist-Alls • Safety-Pull Ratchet Lever Hoists • Spur-Geared Hoists • Differential Chain Hoists • Load Binders • I-Beam Trolleys

the conversion of Sylvania's former International Sales Division into the International Division. Gordon, who started with Sylvania in 1931, formerly headed the International Sales Division.

•

'52 Officers are Elected

Richard W. Camp, vice president, Consolidated Gas Utilities Corp, has been elected president of the Oklahoma Utilities Association for 1952. Camp succeeds C. N. Robinson, vice president, Public Service Co of Oklahoma. Other officers elected were: W. R. Wolfe, vice president, Oklahoma Gas & Electric Co, first vice president; Earl J. Newlin, vice president, State Fuel Supply Co, second vice president; and H. H. Ferrin, vice president and treasurer of Oklahoma G&E, treasurer.

OBITUARY

Harold L. Ickes

Harold Le Claire Ickes, 77, Secretary of Interior throughout the administration of Franklin D. Roosevelt, died Feb. 3 in Emergency Hospital, Washington, D. C., where he was under treatment for complications of a former arthritic condition.

In addition to the cabinet post he held from 1933 until 1946, Ickes served as head of the Public Works Administration from 1933 to 1939. An important part of PWA was the work it did in power and irrigation. Among its projects were the Hoover (Boulder) Dam, Arizona-Nevada; Bonneville Dam, Oregon; and Grand Coulee Dam, Washington. He was a staunch advocate of public power.

Ickes had served as chairman of the National Power Policy Committee during the years 1934 through 1946 and also had been a member of the National Defense Power Commission from 1938 until 1939.

Earlier in his career he was a newspaper reporter and practiced law in Chicago. Throughout his life he was active in politics.

•

Thomas J. Perkins

Thomas J. Perkins, 78, who retired as vice president, director, and general counsel of the Pennsylvania Power & Light Co in 1949, died Feb. 1 at

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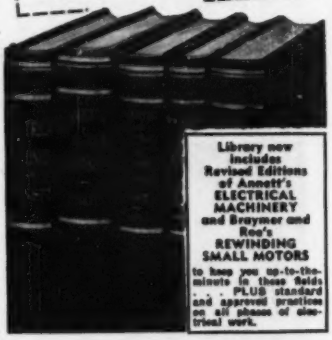
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to keep you up-to-the-minute in these fields . . . PLUS standard and approved practices on all phases of electrical work.

WAS there ever such an opportunity to get started in electrical maintenance and repair—and at top-notch wages? Are you ready with experience and ability—to cash in on it? Others are getting just the sort of background needed—quick!—to handle the great variety of electrical maintenance and repair work TODAY—from this well-known electrical library. You can, too!

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Gives you the "know-how" to tackle any wiring or motor job. Five books show you HOW—to install all types of motor and generator units—to inspect and repair motor starters and generators—to diagnose motor and generator troubles—to figure new windings for old cores, DC and AC windings—to test armature windings, test induction motors, etc., etc.

Includes trouble-shooting book

In addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a handy book giving helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc.

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New York after an illness of several months in the Columbia-Presbyterian Medical Center.

Perkins, a lawyer, started his career in the legal department of the American Telephone & Telegraph Co in New York in 1898. In 1917 he became associated with the Lehigh Navigation Electric Co. When that company was merged with the Pennsylvania P&L in 1920, he was elected general counsel and later vice president, serving in that capacity until 1930. He was called back to service with PP&L and was re-elected vice president and general counsel three years later, continuing until his resignation in 1949.

•

Lewis B. Herrington

Lewis B. Herrington, retired president of Kentucky Utilities Co, died at Madisonville, Ky., Jan. 28.

Herrington joined Kentucky Utilities when it was formed in 1912 and prior to that time had operated power plants in central Kentucky and elsewhere. He was responsible for the Dix River Dam and hydro plant. In 1917 he was named vice president and general manager, becoming president ten years later. He resigned from the presidency in 1933.

•

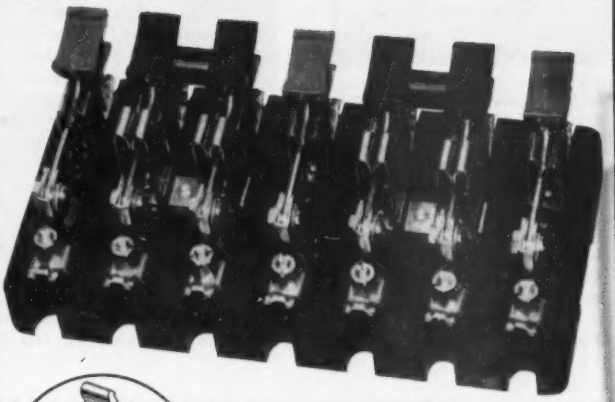
John A. Roebling, 84, engineer, son of Washington A. Roebling and grandson of John A. Roebling of John A. Roebling's Sons Co, Trenton, N. J., died Feb. 2 at Bernardsville, N. J. Roebling, whose father and grandfather were builder and designer respectively of the Brooklyn (N. Y.) Bridge, did experimental work at the Roebling steel wire and cable factory in Roebling, N. J. In his youth, Roebling was unable to participate fully in the firm's engineering activities because of a heart ailment.

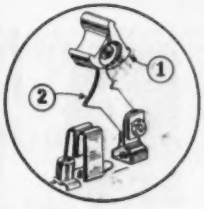
Barton Lewis Christopher, 58, plant superintendent of Central Illinois Light Co, died Jan. 29 at Springfield, Ill. Christopher started with Central Illinois Light in 1911. He was appointed maintenance foreman in 1937 and was made plant superintendent in 1950.

Joseph W. Holters, 54, power sales engineer for Cincinnati Gas & Electric Co, died Jan. 13 at Price Hill, Ohio. Holters joined Cincinnati G&E in 1929.

Another Exclusive STATES feature in "SJK" TEST BLOCKS

NEW SAFETY GRIP HANDLE





This new safety grip handle mounted on the STATES exclusive angle blade is your assurance of easier, safer operation—another step forward by STATES to facilitate the testing and changing of meters and relays.

With the new safety grip handle (1) you are automatically assured of safer, easier gripping to simplify your testing problems. With the angle blade design (2) you needn't worry about insufficient jaw contact because the blade is designed for insertion into the jaw evenly, cleanly. Add this new feature of States type "SJK" Test Blocks to other important advantages of States blocks—advantages which include: large selection of pole arrangements; no live parts extending beyond base; angle bent studs to permit quick changing of front connection blocks over to back connection—and you'll do well to consider States new type "SJK" Test Blocks now.

New safety grip handle available in 12 different colors.

Also, States Blocks meet the E.E.I. and A.E.I.C. Meter Committees Standards.

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MANUFACTURERS & MARKETS

Appliances to Be Redesigned

Because of metal shortages, manufacturers decide to make changes in their products, cut the number of models

The mobilization pinch on raw materials is forcing home appliance makers to redesign most of their products from the kitchen floor up.

It is an industry decision, but the manufacturers do not have much choice. Here is what they are faced with:

They have gone about as far as they can in cutting use of critical materials by easier production switches—doing away with gadgets and trim, substituting more available materials for critical metals in parts and surface features. But for the rest of 1952, at least, they are going to have to cut back even further on use of some key materials.

Less Metals . . . The materials situation shapes up about like this: Mobilization officials have warned the industry it will get less copper and nickel as military demands rise this year and probably through 1953. Aluminum will get tighter, too, though there probably will be a little more next year for consumer goods.

Appliance makers have done pretty well with dwindling metal supplies so far. Despite government reduction of more than 50% in their steel, copper, and aluminum supplies, they have kept appliance output at an average of about 70% of pre-Korea rates.

Industry people figure this rate is at least equal to current consumer demand for most appliances. But they are convinced that demand, which has been light since the late 1950 scare-buying wave, will pick up steadily this year. So there's added incentive—beyond the struggle to stay in business—for getting the most possible production out of available materials.

To Cut Models . . . Besides redesigning, manufacturers are now talking of cutting numbers of models, especially of major items like ranges, refrigerators, and washers. Up to now such talk has not been serious because it was clear the government would not order reductions of lines. You save metal two ways by cutting models. First, it is technically more economical to channel all your metal into a few basic lines. Then, too, you can cut out all or most of the de luxe models, which chew up much more metal than less expensive lines.

The nickel situation points up the present predicament of much of the appliance industry. Since nickel is needed in increasing quantities for jet aircraft and ordinance, appliance makers have made drastic cuts in their use of this scarce metal: to 43% of pre-Korea consumption for electric ranges to 45% for washers, 35% for refrigerators.

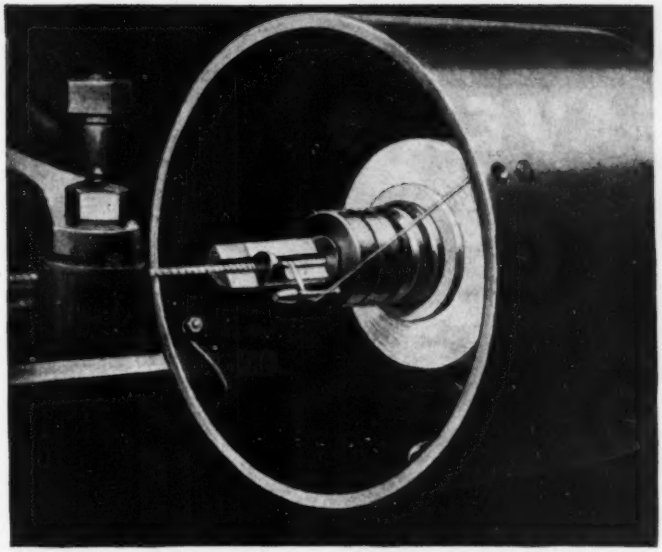
There has been almost as much conservation of copper, which is just slightly less scarce and about as essential for appliances as nickel. One producer of electric ranges rewired all his lines to save copper wire. Another redesigned valves and fittings to save 18 to 50% of the brass used for each. Producers of all major lines have reduced the thickness of sheet copper —and aluminum and steel, too.

At the moment, aluminum is about as tight as copper and nickel. But because new aluminum plants now being built will up the supply in a year or so, appliance makers are experimenting with it as a future substitute for copper in most electric conductor components. Meanwhile, they have made considerable savings through substitutions. For example, a manufacturer of home washers reduced his aluminum use last year by 150,000 lb by using cast iron instead of aluminum die castings for motor end bells.

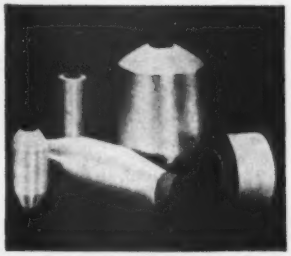
Since you can't take much more critical material out of appliances by this kind of substitution and simplification of parts and attachments, the next step is to design substitute materials into an entire product to make

Art for Westinghouse Ads Wins Award

Otto Kebernick, left, of the advertising department of Westinghouse Electric Corp congratulates artist Lincoln Hafner. The latter's work received honorable mention in the third annual exhibition of advertising and editorial art conducted by the Art Director's Club of Cleveland. Westinghouse had six entries among the 163 hung; these were picked from 550 entries. Hafner's art work was used in three "CSP" distribution transformer ads which appeared in Electrical World on these dates: Nov. 5, Dec. 3, and Dec. 31, 1951.



The insulating properties of L·O·F Fiber·Glass make it ideally suited for use in motors, generators (with unusual space-saving advantage), and on wire and cable. Yarns can be served to wire on standard machines.



Continuous-fiber textile yarn—150 series for many uses, such as electrical insulating tape, sleeving. High dielectric strength. Withstands temperatures up to 800°F.

Now—a fine, new quality source for electrical insulation: L·O·F FIBER·GLASS!

More top-quality electrical insulation made available by new production facilities of Libbey·Owens·Ford Glass Company

HERE'S GOOD news for electrical manufacturers looking for more top-quality insulation. Libbey·Owens·Ford, famous for a wide range of glass products, has swung its resources and advanced technical glass knowledge into the production of L·O·F Fiber·Glass.

You will appreciate the benefits of L·O·F Fiber·Glass in your products—reduction in space, increased efficiency, the ability to withstand heavy overloads, and many others.

If you are already using fibrous glass, investigate L·O·F as a new source of supply. And, get the additional benefits of the high standards of quality and service that L·O·F has established in industry.

For technical data, or consultation on uses of Fiber·Glass in electrical insulation, call your L·O·F office (branches in 24 major cities). Or write, wire or phone Libbey·Owens·Ford, Dept. F·G 1022, Nicholas Building, Toledo 3, Ohio.

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- Easy to install—easy to tape.
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those parts that still must consume critical metal more efficient. The consumer probably won't notice much outward change in the appearance of redesigned appliances. And the manufacturers insist their engineers still have lots of tricks up their sleeves and that quality will not go down much, if any.

•

Ryerson's Steel Plan to Aid Defense Effort

Joseph T. Ryerson & Son, Inc, Chicago steel distributors, has announced a plan designed to get stagnant steel and idle equipment into use or moved to the steel mills as scrap in an effort to aid steel users and the defense program during the emergency period.

The Ryerson company is urging steel users to check their inventories of steel not being used or marked for use; their idle and discarded metal working machinery and allied equipment; and then decide if they should be sold, kept, or scrapped.

To help steel users dispose of items they are willing to sell, Ryerson is offering to publish without charge classified advertisements in its big pictorial type newspaper which is circulated nationally to more than 100,000 firms in all lines of business. In letters to customers explaining the plan, Ryerson points out that the program is designed as an exchange between steel users, making usable steel and equipment that may be lying dormant available to someone else who can use it.

The third phase of the campaign has steel mill and steel distributor salesmen calling on companies to scrap obsolete steel and equipment.

It is believed that this Ryerson effort to free idle steel and equipment will help to relieve the pressure for new steel as well as aid in maintaining a high rate of steel production.

•

Finds Method to Form Unbroken Mica Strips

General Electric Co has developed a method of forming tiny mica particles into continuous strips for use in a wide variety of electrical applications. This announcement raises the possibility that the United States soon may be freed from dependence on

pick the brush Killer that's proved for the job!

When you pick a product for brush control, you can't afford to test 50 or more formulations to determine which one is best for the job. *But we did*—in cooperation with public utility companies, highway departments, railroads and spray service organizations. These tests on many species of brush in all sections of the country at all seasons of the year *proved* that Esteron* Brush Killer and Esteron 245 should be your first consideration in any successful brush control program. Here's why:

Both contain highly effective low volatility propylene glycol butyl ether esters which have been proved by actual use over thousands of miles of right-of-ways. Esteron Brush Killer, a mixture of the 2,4-D and 2,4,5-T esters, is widely used for control of mixed stands of brush. For certain resistant species that need a straight dose of 2,4,5-T—Esteron 245 is the ticket! It is successful also for year-around basal bark and stump treatment.

Both products have excellent storage qualities.

Yes, good results depend on the brush killer you use and how you use it. Pick the one that's *proved* for the job! You are invited to call on Dow sales and technical men for consultation on your brush control problems.

*ESTERON is a registered trade mark of The Dow Chemical Company, largest producers of weed, brush and grass control chemicals.

ESTERON BRUSH KILLER and ESTERON 245

CONTAINING NEW LOW-VOLATILITY ESTERS

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Dow Chemical of Canada, Limited, Toronto, Canada

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LUBRING pliers have a ring of porous, oil-impregnated iron in the joint. This ring carries no stress but feeds lubrication to assure a smooth, free-working joint.

Linemen like their "heft" and feel and power... management likes their long-run economy.

Also available with splicing groove (No. 2595)

UTICA Drop Forge & Tool Corporation
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AND THE WORLD'S BEST TOOLS ARE MADE IN U. S. A.

foreign sources for its mica supply.

According to Robert L. Gibson, general manager of the company's chemical division, GE has found a way to make tiny mica particles adhere to one another and to emerge from machines, now set up in the company's laboratories at Pittsfield, Mass., in a continuous mat, or strip, form.

Development of this "micamat" makes reactivation of domestic mica sources a likelihood and the complex task of "splitting" mica, as it comes from the mines, would be eliminated, according to GE engineers.

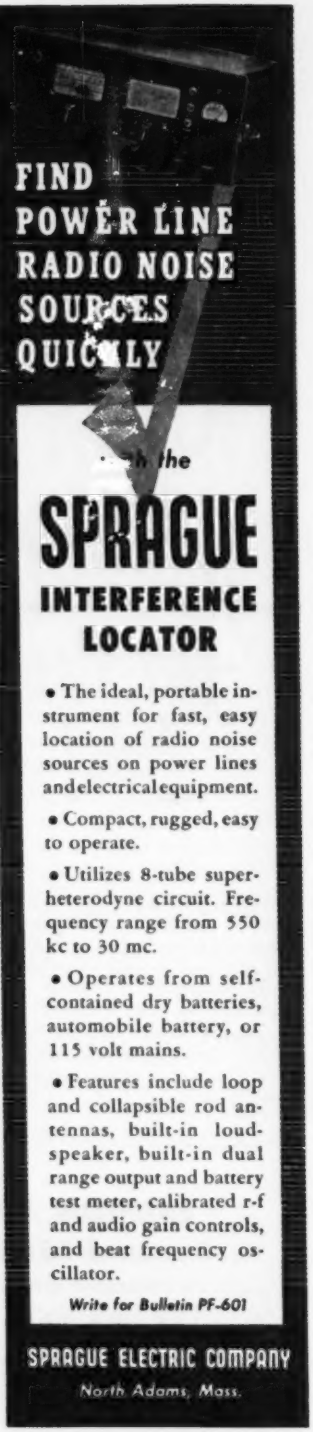
Key to the development is a special process by which the minute mica flakes obtained by grinding up raw mica are so treated that an electrical force is generated which holds the tiny particles together. Sheets can be produced ranging from two to six one-thousandths of an inch in thickness, which have better dielectric strength than present machine and hand-laid mica.

To date, imports of mica from India have accounted for most of this material used by the electrical industry. Most of this mica is imported because it must be split by hand before use by the electrical industry, and no way has been found here to split domestic supplies at labor costs comparable with those in India and certain other areas in the world.

MANUFACTURING BRIEFS

Payroll-deduction purchases of stock have enabled more than one-fifth of the 112,411 employees of Westinghouse Electric Corp and subsidiaries to become part-owners of the company. About 23,000 employees have purchased 385,489 new shares of Westinghouse stock set aside under an employee stock plan.

Sylvania Electric Products, Inc, has purchased the assets of A. W. Franklin Manufacturing Corp and Franklin Airloop Corp of Long Island City, N. Y. Sylvania will continue to operate the new acquisitions in their present location and they will become a unit of the company's parts division. The Franklin corporation produces all types of electrical sockets and Franklin Airloop engages in die stamping of electrical circuits, air loops, and other items.



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SPRAGUE

INTERFERENCE LOCATOR

- The ideal, portable instrument for fast, easy location of radio noise sources on power lines and electrical equipment.
- Compact, rugged, easy to operate.
- Utilizes 8-tube superheterodyne circuit. Frequency range from 550 kc to 30 mc.
- Operates from self-contained dry batteries, automobile battery, or 115 volt mains.
- Features include loop and collapsible rod antennas, built-in loudspeaker, built-in dual range output and battery test meter, calibrated r-f and audio gain controls, and beat frequency oscillator.

Write for Bulletin PF-601

SPRAGUE ELECTRIC COMPANY
North Adams, Mass.

New Electrical Construction

New electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included.

UTILITIES

Proposed Construction

Calif., Fort Huesneme—Yards & Docks Supply Officer, Procurement Div., Bldg. 1-7, Naval Constr. Battalion Center, Fort Huesneme, furnishing generator sets, YDSO 1032-52-9.

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, local control, supervisory control and telemetering carrier-current equipment for Pole Hill Power Plant Colorado-Big Thompson Proj., Spec. DS 3612. L. N. McClellan, ch. engr.

Mass., Hingman—Dist. P. Wks. Office, First Naval Dist., 495 Summer St., Boston, misc. equip. repairs, power plant, Bldg. 28, Naval Industrial Reserve Shipyard, NOY 70871, Spec. 31260.

Montana and North Dakota—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Glendive, Mont., one lot unmounted meters, instruments, switches and line protective and carrier-current relays, Dawson Co. and Miles City Substations; Fort Peck line at Williston Substation, Fort Peck Power Plant, Fort Peck Proj., Spec. DS 3644. L. N. McClellan, ch. engr.

Neb., Omaha—Omaha Public Power Dist., 17 and Harney Sts., superstructure for new North Omaha Power Plant. Total est. $14,000,000. A. C. Johnson, c/o owner, ch. engr.

Neb., Wahoo—Nebraska Public Power System, Columbus, sub-station. $200,000. P. A. Hampton, c/o owner, engr.

North Dakota— K E M Electric Cooperative, Linton, 283 mi. rural distr. lines, Emmons, Kidder, Logan and McIntosh Counties. $325,000. Ulteig Eng. Corp., 1114½ Front St., Fargo, engrs.

Oklahoma—Oklahoma Gas & Electric Co., 321 N. Harvey St., Oklahoma City, Zone 2, 35 mi. 66-kv transmission line from Enid to Guthrie, Garfield Co. $400,000; 25 mi. 66-kv transmission line from Harrah to Meeker, Oklahoma Co. $200,000; 20 mi. 66-kv transmission line from Edmond to Guthrie, Oklahoma Co. $175,000. R. F. Danner, c/o owner, engr.

Oklahoma—K A M O Electric Co-operative, Vinita, material and supplies for Ark-32B rural distr. lines, Craig Co. $90,000. Frank Horton, Lamar, Mo., engr.

Pa., Phila.—General Electric Co., 1405 Locust St., service shop, warehouse and office. $1,000,000. The Kuljian Corp., 1200 N. Broad St., engr.

South Carolina—Black River Electric Co-operative, Sumter, rural distr. lines, Sumter Co., etc. $450,000. Southern Eng. Co., 1000 Crescent Ave., N. E., Atlanta, Ga., consult. engr.

South Dakota—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point, or f.o.b. cars Watertown, three 4,333-kva power transformers; one 69,000-volt voltage-regulating transformer; two 115,000 volt power circuit breakers, two 69,000-volt power circuit breakers; two 115,000-volt horn-gap switches; one 115,000-volt disconnecting switch; three 69,000-volt horn-gap switches; eighteen 69,000-volt disconnecting switches; and one 15,000-volt current transformer for Watertown sub-station, Transmission Div, Missouri River Basin Proj. Inv. DS-3641; furnishing, del. f.o.b. cars shipping point, or f.o.b. cars Huron, three 3,333-kva power transformers; one 69,000-volt voltage-regulating transformer; two 115,000-volt power circuit breakers; one 69,000-volt voltage-regulating transformer; two 115,000-volt power circuit breakers; one 69,000 volt horn-gap switches; one 115,000-volt disconnecting switch; one 69,000-volt horn-

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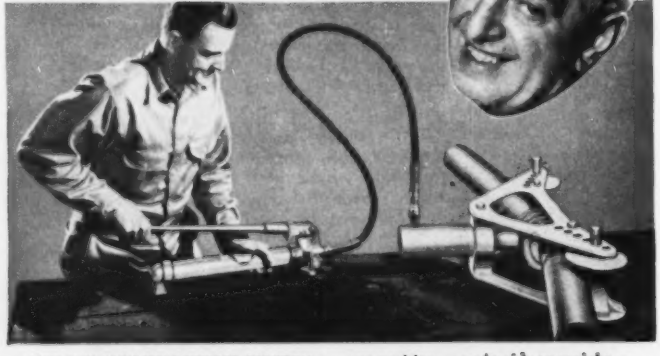

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BLACKHAWK HYDRAULIC Porta-Power EQUIPMENT

gap switch; six 69,000-volt disconnecting switches; and one 15,000-volt current transformer for Huron sub-station, Transmission Div., Missouri River Basin Proj. inv. DB-3645.

Washington—U. S. Eng., 4735 E. Marginal Way, Seattle, Zone 4, station-service control switchboards and appurtenant equipment for Chief Joseph Dam powerhouse, Bridgeport, Inv. 52-35.

Alta., Cold Lake—Canadian Utilities Ltd., 10529 Jasper Ave., Edmonton, power line to service the proposed airport, $850,000.

Low Bidders & Contracts Awarded

Colo., Boulder—Simpson Electric Co., 920 E. 15 St., Cheyenne, Wyo., LB, $164,600, electrical distr. and fence and street lighting, Inv. No. 292-52-17;

Henry W. Miller Elec. Co., 415 S. 18 St., Omaha, Neb., LB, $81,500, protective electric alarm and communications system, Inv. 292-52-16, Rocky Flats Proj. U. S. Atomic Energy Comn., Contg. Officer, Box 5400 Albuquerque, N. M. Bids Jan. 15.

Mich., Flint—Cunningham-Limp Co., 3087 W. Grand Blvd., Detroit, Mich. CA $400,000. 1 story, brick, steel concrete power plant. A-C Spark Plug Div. General Motors Corp., 7-217 General Motors Bldg., Detroit, Mich. Argonaut Realty Div. General Motors Corp., General Motors Bldg., Detroit, Mich., archts.

Mich., Utica—Barton-Malow Co., 2631 Woodward St., Detroit, Mich. CA $150,000. 1 story, electric sub-station, Mount Elliott Plant. Packard Motor Car Co. East Grand Blvd., Detroit, Mich. Geo. G. Zannoth, 806 Park Ave., Detroit, Mich., archt.

Tex., Gainesville—Texas Power & Light Co., Interurban Bldg., Dallas, Tex., Own Forces. $276,000. 5000 kw. electric generating plant unit.

Tex., Kilgore—Southwestern Gas & Electric Co., Longview, Tex. Own Forces. $110,000. electric sub-station expansion.

Tex., Texas City—Carbide & Carbon Chemicals Div., Union Carbide & Carbon Co., Texas City, Tex. Own Forces. $135,000. Power house expansion and imprvs.

Alaska, Kodiak—Puget Sound Bridge & Dredging Co. and Johnson, Drake & Piper, Inc., 2929 16 Ave. S. W., Seattle, Wash., CA, $5,248,000, est. $6,022,000. transmitter facilities, maintenance roads and antennae, taxiway extens., and road relocation at Naval Base. Pub. Wks. Office, 17th Naval Dist., Box 28, Navy, 127, c/o PM, Seattle, Wash. Bids Jan. 15.

Que., Ville LaSalle—Mofax Electric Ltd., 845 St. Andrew St., Montreal, Que., CA, $400,000, electrical services at Naval Stores. Govt. of Canada, Dpt. National Defence Navy, Cartier Sq. Ottawa, Ont. M. P. McAndrew, 1247 Guy St., Montreal, Que., engr.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Colo., Denver—Spears Chiropractic Sanitarium, E. 10 Ave. and Jersey St., Denver, Colo., 4 and 5 story H-shaped 200x270 ft., four wings, brick, steel chiropractic hospital, $14,000,000. Walter Simon, 1922 E. 18 Ave., consit. engr.

N. Y., Riverhead—Dpt. Navy, 18 St. and Constitution Ave. N.W., Wash. 25, D. C., jet plane plant on 4,500 acre site in Calverton-Manorville Wading River areas, to be built and operated by Grumman Aircraft Eng. Corp. of Bethpage, N. Y. $22,000,000.

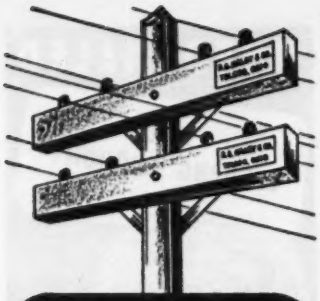
Pa., Pittsburgh—North Allegheny Joint Auth., Allegheny Co., Old Perry Hy., R.D. 7, Pittsburgh, Zone 29. Junior and Senior High School, McCandless Twp. Plans deposit $100 general constr., $50 for other. Mitchell & Ritchey, 524 Fourth Ave., archts.

Tex., Orange—Solvay Process Div. of Allied Chemical & Dye Corp., 61 Broadway, New York, N. Y., ethylene plant (glycol and oxide). $5,000,000.

Wis., Madison—State, State Office Bldg., 1 W. Wilson St., plans by R. C. Kirchoff, state archt., 6 story state office bldg. addn. $2,500,000.

Low Bidders & Contracts Awarded

Ga., Dextertown—Rayonier, Inc., Clyde Morgan, pres., 122 E. 42 St., New York, N. Y., Owner Builds, $25,000,000 pulp mill.



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AIEE Winter Meeting

(*Continued from page* 89)

with use of radar for tracking ice storms. The Illinois company has equipped 95% of its 33, 66 and 132 kv line mileage for sleet melting. Method in general use for ice prevention involves the circulation of current in loop circuits by applying a voltage difference between ends of the loops. A current of 200 amp will prevent ice formation on 3/0 copper at 32 F; 300 amp at lower temp. The short circuit method is used on 33-kv lines with gang operated short circuiting switches used in preference to jumpers to reduce outage time. Melting current is supplied from buses rather than segregated generators, so as not to rob system capacity. Disadvantage of service interruption, inherent in short circuit melting, is avoided by a phase shift method that produces a melting current that depends on the phase shift and the line impedence. Phase shift is obtained by reversing the polarity of one transformer of a 132/33-kv transformer bank. Advantages of the phase shift method are: (1) Less switching, (2) permits service to continue at 85% of normal voltage. This method is used on 66 & 132-kv lines.

DISTRIBUTION

Progress Report on Coordination of Construction and Protection of Distribution Circuits Based on Operating Data for 1949. Joint AIEE-EEI Group

Fault experience of 31 utilities for 1949 preliminarily reported. Weather accounts for 55% of faults (wind 57%, lightning 30%, glaze 13% of these). Trees account for 41% (in 54% of cases trees fell on line). Comprehensive background data.

Performance of distribution systems as a guide to ensuing design and distribution at higher voltages to meet prevailing loads were the comparison themes of this session. Several conference papers were added to the program to record the steady upward trend of distribution voltages. W. R. Bullard, Ebasco Services, commented that it was remarkable that voltages below 5 kv have persisted for so long. He urged that wherever possible the choice of a higher voltage be coordinated with subtransmission plans to avoid a stage of transformation. Transformer cost differentials have narrowed advantageously. R. D. Elliott said Dallas Power & Light swung to 13 kv

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Other GREENLEE timesaving tools for electrical work: Hand Benders; Joist Borers; Cable Pullers; Knockout Tools; Auger Bits and Drills.

in 1937 and has learned since that trees, radio noise, hot line maintenance, conversion from 4 kv, reduction of outages, and sectionalization are no deterrents if fully recognized and met in the design.

Consumers Power uses 7.2 kv or higher for a third of its distribution, some operating 7.2/12.5 kv but none at 14.4/25. This upping paralleled the realization, said E. V. Sayles, that the assumed 3 kva per mile of demand was becoming 7 or 8. Capacity increases of 1½, 3, and 6 had come from progressive addition of phase and ground conductors before the voltages were raised. Rubber gloves are used on the 8.32-kv circuits but hot sticks on the 7.2/12.5 kv.

Confirmation of the 14.4/24.9 kv systems came from Wade M. Edmunds and L. B. Crann, REA. Now 37 REA systems have 11,000 miles, 32 others have 10,000 miles under construction, and 39 are planning 10,000 more miles. Cost is admittedly 20% more per mile than 7.2/12.5 but 70% less per kva because of the quadrupled capability. Some of the expected difficulties have not arisen at all, and REA is confident that the voltage is economical and preferable generally wherever the lower brackets of voltage are not adequate.

INSULATED CONDUCTORS

AC Resistance of Pipe-Cable Systems with Segmental Conductors. AIEE Cable Characteristics Subcommittee

Working equations for calculating ac resistance characteristics of segmental cables, from 1,000,000 cir mils to 2,500,000 cir mils, operating at 60 cycles in steel pipe are presented.

Auxiliary Power and Control Cables for Steam Electric Generating Stations. F. V. Smith and E. G. Norell, both *Sargent and Lundy*

Generating stations and outdoor switchyards present conditions that make use of one type of power or control cable throughout difficult. Essential characteristics of cables used recently are listed.

Generator Lead Practice. M. J. Lowenberg, *Stone and Webster Engineering Corp*

Trend for units over 60,000 kw is toward isolated phase, metal enclosed, bare copper conductor for short runs. All designs except insulated cable on insulators have given trouble.

Because the trend toward purchase of short lengths of many types of cable handicaps the cable manufacturers, R. C. Graham, Rome Cable Co, suggested that alternate types of cable and simplified cable designs be con-

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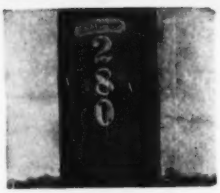
PREMAX



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sidered before ordering. He pointed up the superiority of polyethylene insulation over polyvinylchloride, with the one exception of flamability, and added that rubber alternatives burn as readily as polyethylene but cost almost 54% more. He stressed that circuit continuity tests, but not color coding, be used in installing cable.

H. Richter, Ebasco Services, suggested that papers be presented on cable designs for outdoor stations, where cable goes from indoors to outdoors and perhaps indoors again. More data is needed to settle the current problem of whether to shield single-conductor, 2.4-kv cable with neoprene jacket over rubber insulation, he said. V. Seigfried, American Steel & Wire Co, felt that if the termination problem is the biggest factor in non-acceptance of shielded cable, more thought can be given to improving terminating methods so that reliable, inexpensive and easily made terminations will result.

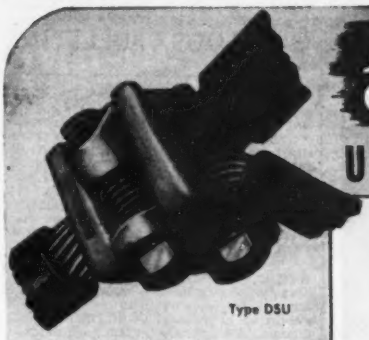
R. J. Wiseman, Okonite Cable Co, and M. Morris, Consolidated Edison Co, reported that tests made on aluminum and other non-magnetic, nonferrous pipe show steel to be the lowest-loss metallic tube for pipe-type cable systems. Wiseman disagreed with the working group's average constant for resistance of cable shielding and suggested that more consideration be given to various types of shielding so that the increased ac losses in pipe-type cable be better determined.

INDUSTRIAL RELAYS

The benefits from educating both management and engineering personnel in the simple philosophy of relay protection were emphasized by W. A. Frankenfield, Detroit Edison Co. If relay equipment manufacturers provided relay protection service for industrial plants, the equipment would cost considerably more, he said.

F. B. Brightman, General Electric, said there is a great need for consultants to make relay studies and felt it was a very lucrative field for them since manufacturers would rather not get into relay application work.

Better coordination is needed between utility and customer regarding the ultimate short circuit kva, according to C. R. Johnson, Port of N. Y. Authority. C. E. Asbury, Commonwealth Services, said that the industrial engineer of a company cannot be expected by management to be a relay expert.



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WRITE FOR CATALOG 45-1

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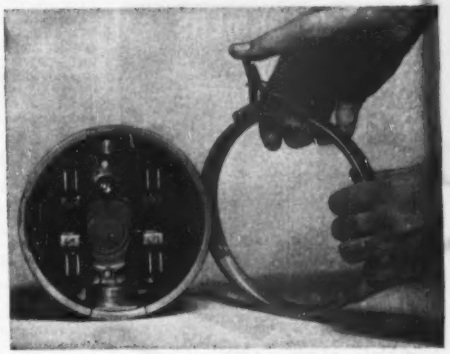
Standard Meter Sockets



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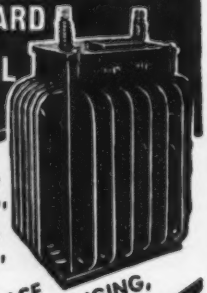

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● ELECTRICAL FITTINGS: This handy, easy to use, reference manual contains illustrations, catalog numbers, price, and weight of complete line of OZ electrical fittings. All information has been indexed three ways—by photo, product name, and catalog number. Available from O Z Electrical Mfg Co, 262 Bond St, Brooklyn, N. Y.

● CHAIN DRIVES: A 32-page booklet shows correct and incorrect ways of solving chain installation, operation, and maintenance problems. It tells how near 100% satisfaction can be obtained by periodical inspection, lubrication, and adjustment. Write for Bulletin 51-7 to Chain Belt Co, 1600 West Bruce St, Dept PR, Milwaukee 4, Wisc.

● TESTING INSTRUMENTS: A buyer's guide for testing instruments, Bulletin GEA-5469, describes various measuring instruments and what instrument should be used for a particular job. Hook-on meters, portable and inkless recorders, flux meters, cycle recorders, tachometers, etc. are described. General Electric Co, Schenectady 5, N. Y.

● SPEED CHANGER: A miniature variable-ratio speed changer is described in Metron Data Sheet 4B. The speed changer is useful in applications requiring remote or automatic control, such as timers, recorders, controllers, computers, indicating mechanisms, and other low-power devices. Available from Metron Instrument Co, 432 Lincoln St, Denver 9, Col.

● METERING TRANSFORMERS: Bulletin S-501-B is a 32-page publication on current, potential and metering transformers. Information in the form of detailed drawings, accuracy limits, ratio, and phase angle curves is presented. Write Standard Transformer Co, Warren, Ohio.

● ADHESIVE TAPES: File cards held in a cardboard folder have been prepared by Polyken Industrial Tapes. Cards are provided for general purpose tapes, electrical tapes, special purpose tapes and general information. Catalog available from Polyken Industrial Tape, Dept of Bauer and Black, 222 W Adams St, Chicago 6, Ill.

● MOTORS: Catalog P 240-3055 describes the Brown Boveri quick-stop motor. Available ratings of motors, technical data and prices are included, as is a description of this single unit drive and brake combination. Brown Boveri Corp, 19 Rector St, New York 6, N. Y.

● MOTOR STARTERS: Complete information on the new line of Arrow-Hart Explo-Safe and Weatherproof motor starters for hazardous locations has been issued. Folder includes dimensions, weights, ratings and wiring diagrams. Industrial Control Division, The Arrow-Hart and Hegeman Electric Co, 103 Hawthorn St, Hartford 6, Conn.

● MOTORS AND TRANSFORMERS: A new bulletin, MU-185, supersedes previous bulletins on Wagner motors, transformers and motor starters. Bulletin covers engineering data on motors, construction features and application uses. Write to

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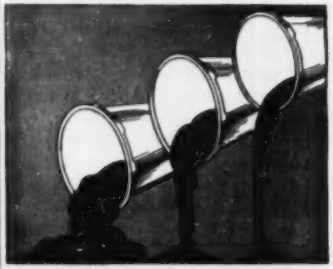

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● INDUCTION MOTORS: Large squirrel-cage induction motors with end shield construction are described in Allis-Chalmer's new catalog. Construction details are described in this bulletin, and many pictures are included. Allis Chalmers Mfg Co, Box 512, Milwaukee 1, Wis.

● SOLDERLESS CONNECTORS: Bulletin 66, a 56-page catalog, lists and illustrates three complete lines of pressure (solderless) connectors. Lines covered are the Lock-Tite line for a complete range of cable sizes; the Tite-Bind line; and the Hinjon line which works on the nutcracker-principle. Connectors, lugs and taps for all kinds of copper conductors from No. 14 through 2,000,000 cir mils are covered. The Thomas and Betts Co, Inc, 14 Butler St, Elizabeth, N. J.

● CURVACORE TRANSFORMER: Bulletin 61 B7641 describes the Curvacore distribution transformer which combines the wound-type core with new insulation applications to provide a smaller unit with greater thermal capacity. The catalog includes dimensions for these transformers. Allis-Chalmers Mfg Co, Milwaukee 1, Wisc.

● TEACHING AID: A newly-revised 24-page teaching aids catalog describes more than 85 free or low cost booklets, charts, posters and other aids currently available to junior and senior high school teachers. Write School Service Dept, Westinghouse Electric Corp, Box 1017, Pittsburgh 30, Pa.

● HOLOPHANE DATALOG: The Datalog includes 64 pages of data on Holophane lighting units. Detailed information is given on 270 lighting units, with special emphasis given to description, performance, application and installation, as well as to dimensional data of this equipment. Holophane Co, Inc, 342 Madison Ave, New York 17, N. Y.

● HYDRAULIC REMOTE CONTROLS: Sperry hydraulic controls are described generally in Bulletin 20-106. Sperry controls are single tube, balanced, self-contained systems operating independently without outside sources of power. Catalog obtainable from C. E. Hohl, Sperry Products, Inc, Danbury, Conn.

● FLUORESCENT BALLASTS: Two publications on fluorescent lamp ballasts are available from G. E. The first, GEA-5731, explains how a fluorescent lamp works and what part the ballast plays in its operation. The second publication, GEA-5672, deals with GE's new system of sound rating its ballasts. The booklet includes a listing of ballasts according to their sound ratings. General Electric Co, Schenectady 5, N. Y.

● LINEAR TRANSDUCERS: These new engineering data folders describe and illustrate the Atcotran differential transformer. Folders contain operation features, electrical data, types available from stock, and wiring diagrams. Automatic Temperature Control Co, Inc, 5200 Pulaski Ave, Philadelphia 44, Pa.

● PYROMETERS AND RESISTANCE THERMOMETERS: Bulletin 1051 describes new indicating pyrometers and resistance thermometers. This 8-page catalog includes wiring diagrams and circuit information of pyrometer, resistance thermometer, tachometer and other actuations. Minneapolis-Honeywell Regulator Co, Wayne and Windrim Aves, Philadelphia 44, Pa.

● SERIES SEQUENCE BALLASTS: The new ballast for the series operation of two 96T12 fluorescent lamps is described and illustrated in Bulletin 551-11. The weight, dimensions and wiring diagrams are included. Write to the Jefferson Electric Co, Bellwood, Ill.

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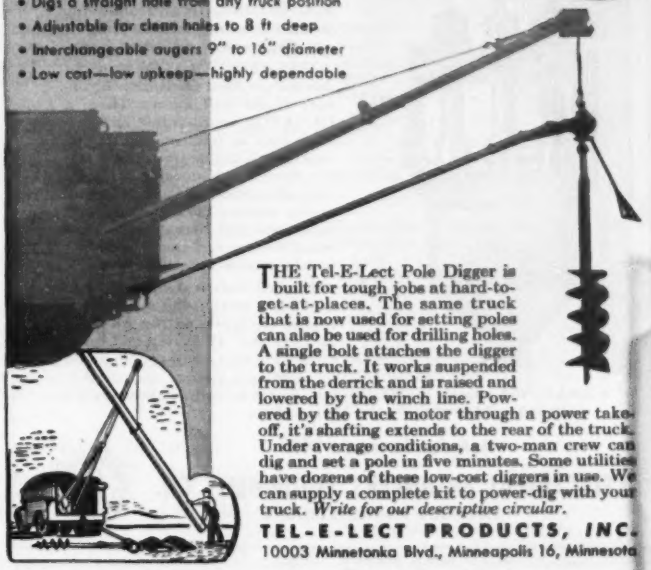

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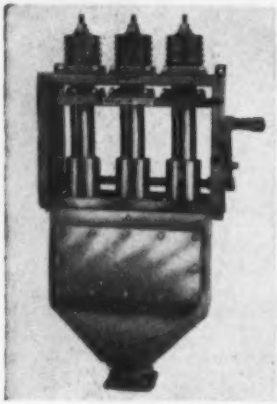

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Vacuum Impregnation—A new 32-page brochure explains the subject of vacuum impregnation. This process permits impregnation of many materials which could not be treated satisfactorily under atmospheric conditions. Not only does this method improve impregnation, but also results in a timesaving. Its applications are in insulation of electrical equipment, including armatures, capacitors, coils, cables, and transformers, filling thermometers and weatherproofing paper and textiles. F. J. Stokes Machine Co, 5500 Tabor Rd, Philadelphia 20, Pa.

Explosion Proof Motors — Underwriters' Laboratories, Inc has released bulletin 46, *An Investigation of Large Electric Motors and Generators of the Explosion-proof Type for Hazardous Locations, Class I, Group D.* Information was gathered on pressures developed by explosions of gasoline vapor-air mixtures in casings of large, explosion-proof electric motors and generators for Class I, Group D, hazardous locations. Underwriters' Laboratories, Inc, 207 East Ohio St, Chicago 11, Ill.

Protective Lighting—A new 24-page booklet B-4791, *Light for Plant Safety and Security*, provides complete plans for outdoor industrial lighting. The book sets forth four principles: discourage attempts at entry, make detection certain if entry is attempted, aid the guard and hinder the intruder, and provide complete reliability. Application suggestions and techniques are given. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Laminated Plastics—*NEMA Standards for Laminated Thermosetting Products*, Publication No. LP1-1951, covers information on manufacture, test, and performance of laminated thermosetting sheets, rods, and tubes. Specifically, the publication describes grades, and contains standards for form, color, finish, thickness diameter, length, width, flexural strength, impact and bonding strength, water absorption, dielectric strength, dissipation factor, arc resistance, density, and compressive strength. NEMA Assoc, 155 E 44 St, New York 17, N. Y.

NBS Annual Report—A 113-page illustrated booklet just published summarizes the scientific investigations conducted by National Bureau of Standards during 1950. The scope of research and development at NBS, both theoretical and practical, is indicated by 13 scientific and technical divisions. National Bureau of Standards, U S Dept of Commerce, Washington 25, D. C.

Electrical Standards—A report of the International Electrotechnical Commission covers the recommendations of four new international standards. These standards cover turbine type generators, climatic and durability testing of electronic components for radio communication, power and distribution transformers, and rules for short circuit conditions of large circuit breakers. Copies may be had from American Standards Association, 70 E 45 St, New York 17, N. Y.

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3	200	G. E.	6900/11430—575
2	150	West.	4800/8315Y—480
1	100	G. E.	2300—575, 3 ph.

INDUCT. REGULATORS—OUTDOOR

1—140 KVA G. E. 200 A. 4000 V. 3 ph.
2—40 KVA West. 200, 400 A. 2300 V.
4—36 KVA G. E. 150-300 A. 2400 V.
2—36 KVA G. E. 75/150 A. 4800 V.

CIRCUIT BREAKERS

1— 600 A. 73 KV G. E. FHKO-236-500 MVA
1— 400 A. 37 KV G. E. FHKO-236-500 MVA
1—1200 A. 15 KV G. E. FKO-139-350 MVA
1— 600 A. 15 KV G. E. FKO-139-350 MVA
2— 600 A. 15 KV G. E. FHKO-136-1328BS
4— 600 A. 15 KV G. E. FHKO-139-750 MVA

BREW, WOLTMAN & CO., INC.
52 Church St. New York 7, N. Y.

A Complete General Electric

Distribution switchboard

In Excellent Operating Condition

Rated 3500 KW, 3 phase, 60 cycle, voltage 2400/4160Y consisting of 5 oil circuit breakers, a main and auxiliary bus, six panels (1 main, 1 meter and 4 distribution) including metering equipment and bus work.

Price . . . $7,500

Purchaser to dismantle and remove equipment from premises.

For detailed information write to the

Ilion Board of Light Commissioners
Municipal Building Ilion, New York
Attention: Mr. Raymond A. Becker, Manager

FOR SALE

Turbine-Generator Unit and Auxiliaries consisting of:

1—Kerr 800HP 3600Rpm condensing steam turbine, 185 lbs. steam pressure, 75 degrees superheat.

1—Allis Chalmers 500KW generator, 80% PF, 2300 volts, 3 phase with direct connected exciter.

1—Set of auxiliaries consisting of condenser, hotwell pump (electric drive), circulating water pump (steam and electric drive) and miscellaneous piping.

Will sell separately or as a unit. Address all inquiries to:

FRED M. LEIPER, Supt.
Water & Light Dept. Wellsville, N. Y.

CORPS OF ENGINEERS, Office of the District Engineer, Detroit District, 1900 Cadillac Tower, Detroit 26, Mich., 11 February 1952. Sealed proposals will be received at this office until 2 o'clock p.m. on the 14th day of March 1952, and then publicly opened for the sale of 5 units of used hydroelectric generating equipment, complete, including turbines, generators, miscellaneous switchgear, etc., presently located at Sault Ste. Marie, Michigan. Copies of sale advertisement No. CIVENG-20-064-52-36 (Sales), may be obtained by application to this office and units may be inspected by application to Area Engineer, Soo Area, Corps of Engineers, Sault Ste. Marie, Michigan.

WORLD'S LARGEST INVENTORY

FREE CATALOG

MOTORS—GENERATORS—TRANSFORMERS
New and Guaranteed Rebuilt
1 H.P. to 2500 H.P.

ELECTRIC EQUIPMENT CO.
P. O. BOX 51, ROCHESTER 1, N.Y.

WANTED

TRANSFORMERS

Wanted for immediate delivery

4-100 KVA or 6-50 KVA used or reconditioned Transformers, rated at 7200/12400 Y Primary and 240-480 Volts Secondary. Wire price and delivery to:

BAUGHMAN MFG. COMPANY,
Jerseyville, Illinois

EMPLOYMENT . . . EQUIPMENT . . . BUSINESS

OPPORTUNITIES

Whatever your need—
think "SEARCHLIGHT" FIRST

U. S. Government

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-3651) will be received by the Bureau of Reclamation, Denver, Colorado, until March 11, 1952, and then publicly opened for furnishing one 6,000-kva, 110,000/63, 510- to 34,500-volt, 3-phase, class OA, outdoor power transformer; two 115,000-volt, 800- or 1,200-ampere and 1,500,000- or 3,500,000-kva (depending on type), 3-pole, power circuit breakers; one 34,500-volt, 600-ampere, 500,000-kva power circuit breaker; and several 34,500- and 115,000-volt, 600- and 600-ampere, single-and three-pole, air switches for Sioux Falls Substation, Missouri River Basin Project, South Dakota. Delivery is desired within 600 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado.

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-3641) will be received by the Bureau of Reclamation, Denver, Colorado, until March 4, 1952, and then publicly opened for furnishing three 8,333-kva, 110,000/63,510- to 69,000-volts, single-phase, power transformers; one 69,000-volt, 25,000-kva output capacity, 3-phase, automatic voltage-regulating transformer; one 115,000-volt, 800- or 1,200-ampere and 1,500,000- or 3,500,000-kva (depending on type), 3-pole, power circuit breaker; one 69,000-volt, 600-ampere, 3-pole, 1,000,000-kva, power circuit breaker; several 69,000- and 115,000-volt, 600-ampere, single- and three-pole air switches; and one 15,000-volt, 200-to 5-ampere, wound-type, current transformer for Watertown substation, Missouri River Basin Project, South Dakota. Delivery is desired within 600 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado.

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-3645) will be received by the Bureau of Reclamation, Denver, Colorado, until March 6, 1952, and then publicly opened for furnishing three 8,333-kva, 110,000/63,510- to 69,000-volt, single-phase, outdoor, power transformers; one 69,000-volt, 3-phase, 25,000-kva output capacity, automatic voltage-regulating transformers; one 115,000-volt, 800- or 1,200-ampere and 1,500,000- or 3,500,000-kva (depending on type of breaker), outdoor power circuit breaker; one 69,000-volt, 600-ampere, 1,000,000-kva, outdoor power circuit breaker; several 69,000- and 115,000-volt, 600-ampere, single- and three-pole, outdoor air switches; and one 15,000-volt insulated, 200- to 5-ampere, single-phase, wound-type, outdoor current transformer for Huron substation, Missouri River Basin Project, South Dakota. Delivery is desired within 600 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado.

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-3653) will be received by the Bureau of Reclamation, Denver, Colorado, until March 13, 1952, and then publicly opened for furnishing three 10,000/13,333-kva, 110,000/63,510- to 34,500-volt, single-phase, class OA/FA, outdoor power transformers; five 34,500-volt, 1,200-ampere, 1,000,000-kva, outdoor power circuit breakers; one 115,000-volt, 600-ampere, 3-pole, air switch; and, forty-one 34,500-volt, 600-ampere, single-pole air switches for Anchorage Substation, Eklutna Project, Alaska. Delivery is desired within 480 and 780 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado.

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FOR SALE

3500 KW ROTARY CONVERTER

Self-starting Type

DC End

Size and 3185 KW at 245 volts
Voltage: 3965 KW at 305 volts
Amp: 13,000
Type: HCC-24
Speed: 300
Form: P
Serial: 5226957
Mfg.: General Electric
Cycle: 60

AC Booster

Type: AH
D-C Volts: 30
Form: P
Phase: 6
Armature amp: 6500
Speed: 300
Freq.: 60
Serial: 5226958
Mfg.: General Electric

1 Westinghouse Transformer

3 phase
25 cycle
13,200-202 volts
5,280 kva
L Spec. No. 179682
125% load 2 hours 60° C rise following full load continuously.

Complete Panel Board

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In good operating condition—can be inspected at original installation.

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UNITED IRON & METAL CO., INC.

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BALTIMORE 23, MARYLAND
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DIESEL POWER

FOR
IMMEDIATE SHIPMENT
UNIT CAPACITIES—10 TO 1875 KVA
A.C.—50 AND 60 CYCLES
VARIOUS VOLTAGES

A PARTIAL LISTING OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1875	Fairbanks Morse	32F16	2000	300	375	Enterprise	DSG-6	450	450
1420	Fairbanks Morse	38D8 ⅛	1600	720	330	Superior	KNA	396	514
1250	General Motors	16-278A	1600	720	312	General Motors	8-268A	480	1200
937.5	General Motors	12-567	1080	720	312	Clark	MD-4	375	327
625	Alco	6-12 ¼x13T	750	600	188	Hartwell Rand	S	225	514
425	Baldwin	VO-6	510	450	187	General Motors	3-268A	150	1200
400	Buckeye	80	480	600	75	General Motors	6043C	90	1200

D.C. UNITS ALSO AVAILABLE

A. G. SCHOONMAKER COMPANY, INC.

ENGINE DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

FROM AVAILABLE STOCK

TURBO GENERATORS

Qu	KW	Make	Desc.
1—	6000	Al. Ch.	Condensing 200/250 I.S.P.2300 v. 3/60 Exc. & Surf or Cond.
1—	750	G.E.	Condensing — 425 lbs. 750 TT I.S.P. 440v. 3 ph. 60 cy.—Built 1944
1—	500	Moore	Non-condensing. 150/200lbsISP A.35 lbs. G.B.P. 3/60/480 volts Direct Connected Exciter
1—	400	Westg.	Non-condensing — 125/150 lbs. I.S.P. 5/10 lbs. B.P.—240/480 v. 3 ph. 60 cy.
1—	300	G.E.	Non-condensing 150/175 I.S.P. 5/10 B.P.—480 v. 3 ph. 60 cy.

SYNCHRONOUC CONDENSERS

	KVA	Make	Type	Volts	Speed
1—	5000	Whse.		2400/4150	600

MOTOR GENERATOR SETS
3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts	
2—	2000	G.E.	500	600 25 cy.		11000
1—	1500	G.E.	720	900		13200
1—	1500	G.E.	360	275	2300	4600
1—	1000	G.E.	900	250	4100/6900	
1—	500	Whse.	900	250	6600/13200	
1—	500	Whse.	1200	125/250	2300	
1—	500	Whse.	900	250	440	
1—	500	G.E.	720	125	2300	
1—	400	G.E.	720	250	440/2300	
1—	350	G.E.	900	125	4150	
1—	240	G.E.	1200	250	2300	
1—	150	G.E.	1200	275	2300	
1—	150	Whse.	1200	275	2300	
1—	140	Cr. Wh.	690	125/250	2300	

TRANSFORMERS—60 Cycle

	KVA	Make	Type	Ph	Voltages
1—	2000	Pitts	OISC	3	13200x4600/2300
1—	1250	Whse	OISC	3	13200x525
3—	1250	G.E.	HVDDJ	1	6900x550
3—	1000	Pitts	OISC	1	22000x13200/2200
3—	1000	GE	HVDDJ	1	2200x480
3—	500	A.C.	OISC	1	13200/2300

BELYEA

COMPANY, INC.

OFFICE & SHOP
51 Howell St., Jersey City 6, N. J.

TRANSFORMERS

BOUGHT AND SOLD

We carry a large stock of transformers, and invite your inquiries. New Transformers built to your specifications.

PIONEER TRANSFORMER REBUILDERS

We rewind, repair and redesign all makes and sizes.
One Year Guarantee.

THE ELECTRIC SERVICE CO., INC.

"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
SINCE 1912 CINCINNATI 27, OHIO

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

TRANSFORMERS

1—1500 KVA Whse., 3 Ph., 33,000/66,000-540/480V. HT taps
1—1500 KVA G.E., 3 Ph., 4150V, 2300V Pyranol
3—400 KVA G.E., 1 Ph., 6900V 2300V Sec.
1—200 KVA G.E., 3 Ph., 2400-220 Sec.
1—100 KVA Wagner, 1 Ph., 240V pri., 120V sec.
2—100 KVA Newark, 440V 3 Ph., 220V 2 Ph.
6—50 KVA G.E., 1 Ph., 13,400V, 120/240 Sec.
2—37½ KVA Allis, Air, 1 Ph., 480V pri., 120V sec.
1—25 KVA G.E., 1 Ph., 11,500V pri., 230/460V sec.

SYNCHRONOUS MOTORS

1—300H.P., Elec. Mach. 720 RPM. 3 Phase 60 cyc., 2200V. Totally Enclosed Fan Cooled Outdoor service.

MOTOR GENERATOR SETS

1—1000 KW G.E., 600 V. 514 RPM, 4000V Syn.
1—200 KW Whse., 275V, 900 R.P.M., 230 V. Syn.
1—176 KVA Westi., 1 Ph., 220V, Motor 3 Ph., 440V.
1—150 KW G.E., 125/250V, 1200 RPM, 2300 Syn.
1—75 KW Crocker Wheeler, 250V, 1200 RPM, 2300/4150V Syn.

SLIP RING MOTORS

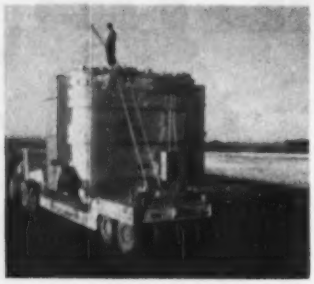
1—2300 HP G.E., MT, 257 RPM, 6600V.
1—250 HP Westi., CW, 600 RPM, 440V.

SYNCHRONOUS CONDENSER

1—3500 KVA Whse., 720 RPM, 2200V with D.C. EXC.

Large Stock of A.C. and D.C. Equipment

LETTERS TO THE EDITOR



In Parallel, Not Tandem

To the Editor

Please refer to "tandem" in any English dictionary and then turn to p 104 and 105, of the Nov. 5, 1951 issue of Electrical World. Your face should be red unless you are one of the every day newspaper boys.

C. T. Blackmore
435 Sixth Avenue
Pittsburgh 19, Pa.

• We looked and it certainly is.

Farm Market Reprints

To the Editor:

I have gone over, with considerable interest, the article, "Future Farm Market Heads for Record Growth," p 103-118, Electrical World, December 3, 1951.

It is only natural that I would be very much interested in your presentation; however, several thoughts come to me now that I have read it:

1. All agricultural engineers and rural area representatives in the electrical industry do not receive Electrical World regularly.

2. Vocational agricultural instructors as a rule do not receive your publication.

3. County extension agents do not subscribe to the publication generally.

4. The average electrical dealer does not take the publication.

In lieu of the above, we are confident that you will put this article in reprint form in order that it may be made available to all these groups. While the article is not particularly slanted to these groups, we are confident that it would be welcomed by them, since it does very clearly indicate the vast potential in the rural market for rural electrical equipment dealers. County agents, vocational agricultural instructors, and others would be interested since it shows clearly that electricity is becoming an integral part of successful farming and is being accepted as such by a large number of farmers across the country.

We could use 1500 to 2000 copies of the reprint to good advantage if you elect to make them available.

L. L. Koontz
System Rural Sales Supervisor
Appalachian Electric Power Co
Roanoke, Va.

• Reprints will be available.

Banned in Boston

To the Editor:

It seems unfortunate your valued journal failed to carry the latest news of the National Electrical Code situation in Massachuetts which on September 13, 1951 adopted the 1951 National Electrical Code. The uniform wiring standard is applicable throughout this entire Commonwealth, with the exception of Boston where separate legislation prevails.

John M. Turnbull
Director
Area Development Dept
Western Massachusetts Electric Co
Springfield, Mass.

Higbee Misquoted

To the Editor:

Here are some comments on the reporting of President Higbee's address which appeared in the November 26, 1951, Electrical World, pages 12-13. Some unfortunate misinterpretations and omissions in the report tend to convey erroneous impressions.

A careful reading of Mr. Higbee's address will reveal that it was directed primarily at what had happened in Cleveland, where a very drastic approvals provision had been included in the Building Code. Detroit was cited as a case where consideration had also been given to such legislation. Owing to an important omission, your article gives the impression that the Detroit authorities still have these provisions under active consideration. Such is not the case, as was reported by Mr. Higbee when he said:

> "Fortunately, through the efforts of NEMA members in Detroit and the staff, and with the cooperation of the Detroit Edison Co, contractors, dealers, and the authorities in Detroit, consideration of this proposal and of the revision of the Detroit ordinance has been placed in the hands of the Electrical Association of Detroit, representing all phases of the electrical industry."

The wholehearted cooperation received from the Detroit authorities, particularly from Kent Steiner, the new Chief Electrical Inspector, and from representatives of all branches of the electrical industry, in considering favorably the deletion of these provisions, warrants recognition.

L. D. Price
Engineering and Safety
Regulations Department
National Electrical
Manufacturers Assn
New York 17, New York

Perennial Question

To the Editor:

In reading the editorial "No Free Lunch" on page 70 of Electrical World for December 17, 1951, I was reminded of a question as to the use of "electric" and "electrical" which has frequently disturbed me. I think I may recognize the editorial staff of Electrical World as competent authority on use of these words so I post my question to you.

It is noted that in paragraph two of the editorial the terms "electric power" and "hydroelectric power" are used. Also in the last paragraph appears the term "electric power" shortly followed by the term "electrical energy." As nearly as I can frame my question it would be this:—Are the words "electric" and "electrical" properly used interchangeably as adjectives in connection with power, energy and any other appropriate noun?

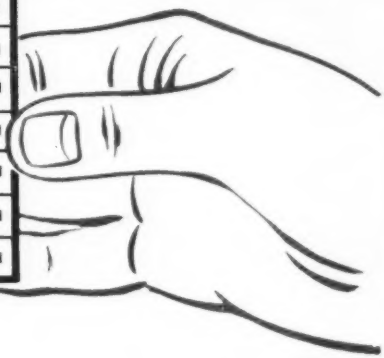
H. J. Flagg
Executive Officer
Board of Public Utility Commissioners
State of New Jersey

• The American Standards Association differentiates the two words by exact definition. But like many other standards it is not generally adhered to in practice. In our book and in Webster, the words are used interchangeably, the determinant being custom and usage, based, presumably, on phonetics.

MORE USEFUL LOAD
from Existing Capacity!

Volts	Regulator KVA	Amps	Exciting KVA	Reactive KVA Savings Over Other Types	Evaluation At $10 Per Reactive KVA
2400	12	1.7	4.08	8.16	$ 81.60 saved
2400	36	2.2	5.28	10.56	$105.60 saved
2400	60	2.6	6.24	12.48	$124.80 saved
2400	96	3.3	7.92	15.84	$158.40 saved
2400/4800	12	1.0	4.80	9.60	$ 96.00 saved
2400/4800	36	1.4	6.72	13.44	$134.40 saved
2400/4800	60	1.9	9.12	18.24	$182.40 saved
2400/4800	96	2.5	12.00	24.00	$240.00 saved
6900	17.3	0.4	2.76	5.52	$ 55.20 saved
6900	34.5	0.7	4.84	9.68	$ 96.80 saved
6900	69.0	1.3	8.97	17.94	$179.40 saved

This chart shows your savings in initial cost



5/8% Step Voltage Regulators

High excitation current required by older types of regulators overburdens your system with reactive kva and increases initial cost.

Call your nearest A-C district office to get the complete story on how Allis-Chalmers 5/8% step regulators increase useful load. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.

YOU GET MORE USEFUL LOAD from existing system capacity when Allis-Chalmers 5/8% step regulators are on the line. Compared to other types of regulators with an air gap in the magnetic circuit, they use only 1/3 the exciting current, freeing kva for revenue-producing loads. In some cases, they use only 1/4 or 1/5 the exciting current.

REDUCES INITIAL COST

The initial cost of Allis-Chalmers 5/8% step regulators is lower because of the difference in reactive kva. The addition of static capacitors to regulators with an air gap in the magnetic circuit frequently adds as much as 5% to the cost of installation (figured at an average cost of $10 per kva installed). This can mean an additional cost of $150,000 for a medium sized utility.

SIMPLIFIED SWITCHING

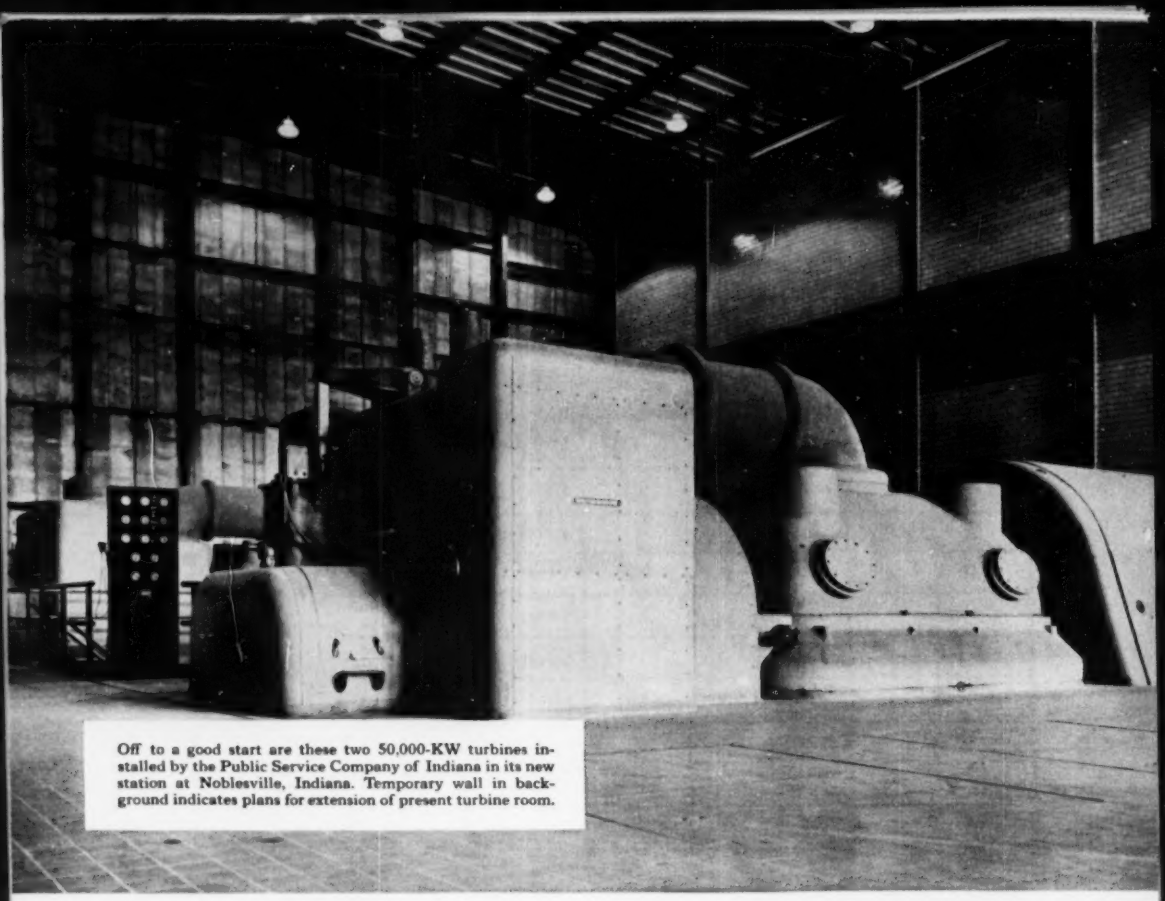
Because of the lower excitation current, switching is greatly simplified too. Switching is no more difficult than on a similar sized transformer. No special circuit breakers or switches are required.

Most important of all, you get the major advantages of the Allis-Chalmers 5/8% step regulator line: ± 1 volt band, 20% range of regulation, easy control adjustment, close average voltage maintained by voltage regulator, unit construction for easier maintenance, and long life contacts.

A-3591

ALLIS-CHALMERS

Originators of 5/8% Step Regulation



Off to a good start are these two 50,000-KW turbines installed by the Public Service Company of Indiana in its new station at Noblesville, Indiana. Temporary wall in background indicates plans for extension of present turbine room.

New turbines with the future guaranteed

● When these two 50,000-KW turbines were placed in service recently for the new Public Service Company of Indiana generating station at Noblesville, Indiana, NONPAREIL Turbine Oil was used for the initial fill . . . assuring trouble-free lubrication for the life of the turbines themselves.

With this installation, as with every installation of NONPAREIL Turbine Oil, plant operators received a written guarantee that the oil will last as long as the turbines and will never exceed a neutralization number of 0.15 mg. KOH/gm. Lasting, low-acidity assures that NONPAREIL will not have to be removed for treatment or for cleaning the lubrication system.

For guaranteed lubrication in your own turbines . . . new or old . . . fill with NONPAREIL. A Standard Oil lubrication specialist can show you the facts, including service records covering up to twenty-three years continuous operation of NONPAREIL Turbine Oil. Contact your local Standard Oil Company office. Or write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

NONPAREIL
TRADE MARK
Turbine Oil

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